THE

# ELECTRICAL REVIEW.

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## ELECTRICAL REVIEW.

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**THE**

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**(J. A. BERLY'S).**

# 1909 EDITION

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## THE LONDON COUNTY COUNCIL AND TRAMWAYS STREET WIDENINGS.

THE Finance, Improvements and Highways Committees of the London County Council have issued a joint report under date of 2nd inst., on the allocation of cost of tramway street widenings.

We cannot emphasise too strongly the importance of this movement on the part of the L.C.C., as the principles underlying the question of cost of street widenings apply not merely to London, but to the whole country.

We have for many years directed attention to the hardships imposed upon the tramway companies by the exactions of local authorities in using their powers of veto to extort extravagant contributions towards street improvements, and have also shown how in the past the London County Council have, when dealing with their own tramway accounts, adopted an entirely different policy, by relieving the construction accounts of even a reasonable share of the cost of widenings, by charging the bulk to the general improvements account.

In the report before us, the Joint Committee admit that "the question of charging any portion of the cost of improvements to the tramways account has only arisen of late years, namely, since 1899," and they point out that "during the first 11 years of the Council" a total of £6,355,956 was voted upon improvements without any reference to the provision for tramway purposes. Up to 1899 about 30 improvements along tramway routes had been undertaken, and only about one-third of the cost was charged to the tramway account.

The Improvements Committee in 1903 considered that there were three classes of street improvements which had reference to tramways, namely :—

1. Those entirely necessary for the accommodation of the general traffic quite apart from any tramway traffic.

2. Those necessary in order to meet the needs partly of the general through traffic, and partly of the tramway traffic.

3. Those cases where it is quite unnecessary to widen the thoroughfare for the purposes of the general traffic, the existing width being sufficient, and where any widening would therefore be entirely for the assistance of the tramway undertaking.

To these principles no reasonable exception can be taken, and if embodied in an Act of Parliament which would govern the action of local authorities whether in respect to the regulation of their own accounts or their dealings with private undertakings, the grievances so long complained of would cease to exist.

The methods of accountancy hitherto adopted by the L.C.C. gave altogether a fictitious result of the municipal trading in tramway enterprise—a veritable "fool's paradise," from which there appears to be now some prospect

of escaping, by a radical reconstruction of the accounts and the adoption of a sounder system in future.

The Finance Committee's report of June 23rd, 1908, contained many items of interest bearing upon the practice of the Council in dealing with street improvements.

In the first place, they referred to the fact that under the London County Council (Improvements) Act, 1900, it was enacted that :—

"In any case, where the Council carry out any improvement of a street in which a tramway is intended to be laid, the Council may, if they think fit, apportion the costs and expenses in such a manner as they may think proper between the improvements account and any separate account which they keep in relation to tramways."

The result of the exercise of this discretion was, as the Joint Committee point out, to apportion the costs *rather as one of policy than of accountancy* (the italics are ours), and hence the methods adopted for proving to the ratepayers that the municipal enterprise was profitable or otherwise according to the proclivities of the party that happened to be in power.

The report refers to the action of provincial local authorities as regards allocation of cost of street widenings connected with tramways, the policy being by no means uniform. Thus, at Birmingham, out of £250,000 the tramway account is charged with £170,000, while at Manchester only £100,000 is appropriated in that way.

As to contributions by tramway companies, the L.C.C. Committee do not appear to be free from the desire to extort payments not based upon the equitable principles involved in their three classes of street improvements to which we have referred, for they argue that the Council and tramway companies, in relation to street improvements in connection with tramways, are not analogous, because, they argue, "the tramway company's main object is to obtain its concession at the lowest possible cost," and they let the cat out of the bag when they add that "the payments made by tramway companies in respect of street improvements are matters of bargain between the company and the local authority, and are not determined on any settled principle."

Thus is the door opened to all sorts of intrigue, and with such a statement from the great local authority of the capital of the United Kingdom, it is time that Parliament intervened and settled the basis upon which this important matter should be dealt with.

The Joint Committee recommend that, in considering the question of whether the tramways account should be required to bear any part of the cost of the street widenings, some guiding principles should be laid down.

Messrs. Peat & Pixley, the accountants to whom the matter was referred, consider that contributions by the tramways should be governed by the "benefit derived or to be derived by the tramways," and the Committee adopt the principle that the proportion of charge should be determined according to benefit, and they add that in determining the amount of contribution "the charges falling on the tramways account for rates on, and maintenance of, the permanent way" should be considered.

This principle should not be lost sight of by tramway companies when making their bargains with the local authorities.

The accountants suggest that expert advice should be obtained to advise the Council—but the Committee would prefer to leave the matter in the hands of their permanent officials, and obtain a joint report on each case, from their valuer, chief engineer, and comptroller, and that this report should be available for the use of the Finance Committee when considering the financial bearings of the proposal.

The recommendations of the Joint Committee are embodied in a series of proposals for consideration by a special body consisting of three members from each of the following committees, viz., Finance, Highways and Improvements, and in amendments proposed, it is suggested that they should be empowered to obtain the advice, or the arbitration, of the chief of the London traffic branch of the Board of Trade, or some other independent authority approved by the Council.

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**The Technical Journal: Its Work and Influence.**

We shall be glad if every reader will make a special point of closely studying the remarks on this subject by Mr. H. M. Wilson, an American editor, that appear on another page of this issue. Mr. Wilson's very interesting views were intended to apply especially to journalism on the other side of the briny, but those of us who, for the greater part of our lives, have followed such matters from behind the scenes, know only too well how aptly they are applicable to the new condition of things that has arisen in this country too during the last few years. The theme of the position, function and influence of the technical press in its relation to and bearing upon modern life, thought, and activity, is a great one upon which we could write the Thames dry, if the British Navy were not there, but we will save our readers that infliction just now. Much might be written on what the trade thinks of the Press and *vice versa* ; the criticisms of our friends and foes alike concerning why we publish this and do not publish that ; the great necessity for the technical Press by sound judgment to act as a corrective of the errors of misguided journalists who labour under either a desire to tickle the fancy or an order to propagate and disseminate a shibboleth ; the mistaken notion that all we, like sheep, have gone astray, and as editors are as easily gulled as an uninitiated public ; the opinion of some that we are philanthropists pure and simple—or ought to be—in business for the fun of the thing ; that we will publish, or ought to do, this, that or the other matter, view, description or opinion for a solatium ; that we are out hunting for "copy," as we were told only last week by an exhibitor's representative, because, forsooth, we have not matter enough to fill our pages in these days when every other man in the profession or industry is a penman ; that we are "stodgy" ; that we have no humour, or too much ; that we give too much matter—that we give too little ; but there, we shall exhaust our ink supply if we even proceed to specify the mere headings of what we would write if we were only to let ourselves go. For the moment we will be content if Mr. Wilson's remarks are read and re-read, and perhaps by some re-read again. We have never thought it necessary to publish sheaves of testimonials like a quack medicine or electric belt vendor, preferring rather to let our work speak for itself, but we are inclined to agree with Mr. Wilson that "the functions, opportunities, and the merits of the technical Press are not as fully understood and appreciated as they might be."

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**Copper.**

Messrs. Merton's circular for July 15th, 1909, shows the imposing figure of 70,450 tons visible supplies, of which 58,100 tons are stored in English ports. Afloat from Chile and Australia the quantities are up to average. The shipment figures for mid-month can hardly be taken as indicating very much,

bearing generally no fixed relation to the final figures for the month. Those interested in copper will, however, digest the salient features of the market (*a*) increasing supplies (*b*) maintained price, and make their own deductions.

The *Mining Journal*, in the issue of the 10th inst., reviews the situation for the past six months very clearly. It emphasises this maintenance of prices in the face of large output and low consumption in the States. As pointed out, the price can only be due to (*a*) large deficiencies in Europe which have to be made good; (*b*) financial support by the owners. The latter supposition, which the *Journal* seems inclined to indicate, would hardly be co-incident with increasing supplies. In a country to which nature has been so generous as North America the revival in trade cannot be long delayed, but it may take another year to develop. In this case copper falls.

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**What is a Telegraph?**

We have always regarded it as somewhat anomalous that in the eye of the law the word telegraph as used in the Telegraph Acts, 1863 and 1869, has been held to include telephone, although the telephone was not invented or contemplated in 1869. A conversation through the telephone was held in the famous Edison case to be a communication transmitted by telegram within the meaning of those Acts. This principle was recently reaffirmed by the House of Lords in the case of the Postmaster-General *v.* National Telephone Co., 1909, 100 L.T. Rep. 658, where it was held that private telephone lines connecting two or more separate and independent persons or businesses, and electric fire alarms and similar signals, are not excepted from the monopoly of the Postmaster-General.

It is interesting to find, however, that this principle is not to be universally adopted. In a recent Irish case a serious and important question arose as to the meaning of "telegraph," which phrase was used in a contract between the Postmaster-General and a railway company. The contract provided that "the company shall . . . . convey from station to station . . . . free of expense from the Postmaster-General all telegraph materials used—or intended to be used—for the construction, maintenance, repair, or renewal of any of the Postmaster-General's lines of telegraph situate on their system of railway." It was contended that, having regard to this clause, the company were bound to carry all kinds of telephonic instruments, appliances and apparatus. By another clause the company undertook to convey, free of expense, all salaried officers and workmen (except telegraphists) employed by the Postmaster-General in the construction and repair of the lines of telegraph on the company's system. Mr. Justice Dodd held that in construing covenants the fulfilment of the evident intent and meaning of the parties was the design of the Courts, which did not confine themselves within the narrow limits of a literal interpretation. Accordingly, he held that the word "telegraph," as used in the deed, could not receive the same wide interpretation as it had received in England on the construction of the Telegraph Acts, and he declined to accede to the contention of the Postmaster-General. Inasmuch as similar agreements are in force between the Postmaster-General and most of the railways in the country, this decision is likely to be far-reaching in its effects.

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**The Need for Continuous Progress.**

Many people have the notion that those who control large industrial undertakings are able to relax their efforts and have a "good time" when effective working order has been established. No greater fallacy exists: continuous efforts on the part of both staff and workmen are essential to continuous success. There is no standing still, the undertaking which attempts to rest upon its oars falls behind trade competitors who are continuously going forward. We do not mean that every employer is to remain in a state of frenzied exertion, but sustained effort towards improvement must be present amongst a large proportion of the staff and workmen if the undertaking is to keep pace with its neighbours; neither is it possible or necessary for a manager and his assistants who take over the control of an out-of-date concern to keep up the overwork required during reorganisation. Once an undertaking has been put into working order, provided that efficient methods have been adopted, some relaxation of effort is allowable, and improvements can be quietly taken in hand one by one, but the process must be *continually* going on.

The developments in competitive firms both at home and abroad should be closely studied, with a view to improving upon their practice. The firm that is content cautiously to imitate the lead of its more enlightened contemporaries never scores a conspicuous success. Such undertakings, if carefully managed, may just contrive to show a small profit, but the value of their ordinary stock will usually remain well below its nominal figure, and the results cannot be looked upon as satisfactory.

Conspicuous success is to be met with only amongst those concerns which are constantly initiating new designs and methods under the guidance of sound commercial judgment. This policy ensures the full benefit of the improvements for their initiators, as the effect of all improved designs and methods is to lower prices when the new practice has been widely adopted. This feature does not, however, concern the firm that introduces the innovations, large profits being therefore netted whilst the imitators have to be content with whatever margin remains after the prices have been reduced.

Another aspect is to be found in the value of obsolete machinery. The leading firm, when it has satisfied itself of the effectiveness of some new machine or appliance, can still dispose of its old equipment at remunerative prices, whereas the rank and file will only obtain scrap value for their obsolete plant.

It is to be feared that there is a lack of enterprise in this country as regards the adoption of new methods and designs, and that too many undertakings are contenting themselves with the small profits accruing to those who pursue the cautious policy of imitating their neighbours. On the other hand, certain precautions must be observed in adopting the go-ahead policy, or disaster may follow instead of enhanced profits. The best technical advice must be retained whatever the cost, sound commercial judgment being equally essential. Given these two factors, however, the returns should fully counterbalance the extra risk, and we should like to see a little more enterprise in this direction on the part of the British manufacturer.

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**The Electric Lighting Acts (Amendment) Bill.**

This Bill, which has formed the subject of so much correspondence in our own pages and elsewhere during the last few weeks, was before Standing Committee "C" of the House of Commons on Tuesday last, and after amendments were made to a number of the clauses, it was ordered to be reported to the House. We commence our account of the proceedings on another page of this issue, and hope to bring the same to a conclusion next week. Our report does not yet reach the much-debated Clause (16) which concerns the electric wiring and contracting powers of municipalities, but we regret to state that the Committee saw fit to omit the words "through a contractor, but not otherwise," which were added in the House of Lords. The possibility of this being done was, of course, foreseen, though some of us had hoped that the interests of private enterprise would have not been lightly trampled under foot, allowing municipalities to unfairly compete with sections of their ratepayers. We have received a letter from Mr. E. Garcke since the closing of our "Correspondence" pages, in which he expresses satisfaction that certain alterations, desirable from the point of view of electrical companies, have been made in Clauses 2, 6 and 13, by the Committee, making it unnecessary to further oppose the Bill on the grounds named by him in his earlier communication. His letter will be available in our next issue, together with the conclusion of the proceedings.

## ENGINEERING AT THE UNIVERSITY OF BIRMINGHAM.

The University of the Midlands has been called the business man's university, but it is *par excellence* one for engineers, and for the purpose of educating that class of the professional community the greater part of the magnificent pile within sight of the city of Birmingham has been erected.

Details of the power station—a detached block—were given in our issue of August 25th, 1905, but the following additions to the equipment have been made to meet the requirements of the newer blocks and the women's hostel:—A 50-I.H.P. horizontal compound Ruston-Proctor engine drives a 440-volt Westinghouse generator. A 60-KW. three-phase motor (to utilise the available power of the three-phase generator driven by the McLaren engine), drives two D.C. generators, one for each half of the battery. There is a balancing set of two 6-KW. compound dynamos; 20 cells at each end of the battery provide voltage regulation. The wiring of the buildings supplied is carried out on the three-wire system, with 440 volts between the outers. The battery was supplied by the E.P.S. Co.; charging set by Messrs. Siemens Bros.; balancer by the Lancashire Dynamo Co.; cables by Messrs. W. T. Glover & Co.; and the switchboards by Messrs. Morris & Lister.

There are now available for testing several petrol engines, a special test bed having been provided.

Important additions to the smelting section are a Moissan electric furnace and an oil furnace; the latter is the invention of Mr. Ward, a member of the metallurgical staff.

The Mechanical Engineering Department takes up the whole space of Block A, as it is designated. The machine shop is equipped with the most modern types of representative machine tools of British, Continental and American practice. With the exception of a large planing machine, all the tools are group-driven, by three electric motors. The pattern shop is similar in equipment to that of a large works. Above these two shops are the main drawing office and the Hall of Machines. A loom is now being installed in the latter, and it is hoped that in the near future other specialised machines will be housed there through the generosity of manufacturers and private donors, so that the students may become fully acquainted with the latest mechanisms.

The Civil Engineering section occupies about the same space as the Electrical, and is in the same block. On the lower floor is the strength of materials and hydraulics laboratory; here is erected a 300-ton girder-testing machine, by Messrs. W. and T. Avery. There are several smaller testing machines, one of 50 tons, and another—American—of 200,000 lb. The load for the latter is applied by means of a three-phase motor through suitable clutches and gearing, capable of six variations in speed. In the case of the other machines, hydraulic pressure is provided by an accumulator fed by a three-throw pump, driven by a motor on the alternating supply. A motor-generator set of 17 KW. capacity, by the B.T.-H. Co., provides direct current for a 20-H.P. motor of large speed variation, which drives a duplex pump, giving a steady discharge up to 600 gallons per minute, which is led direct to turbines, the maximum pressure corresponding to a head of 250 ft. Other pumps, turbines, meters, pipe lines, and measuring tanks complete the equipment in the laboratory.

The special feature of the University is its engineering side, and the chief section of this side is without doubt that which deals with electrical work. The Electrical Engineering Department covers an area of about 7,000 sq. ft. Students in their third year familiarise themselves with instruments and meters, make elementary tests on the machines in the senior laboratory, and test the electrical properties of iron and other materials. In the fourth year the work is more advanced, and commercial tests are carried out on the various machines and transformers. Thorough tests are also made on the direct-coupled generators in the power station.

A notable feature is the fixing of many of the instruments on small boards, provided with special brass clips, so that they may be suspended from the nickelled-brass instrument rails on the work benches, leaving the latter clear for other apparatus.

At the south end of the senior laboratory is the main switchboard. Direct current at 110 volts and three-phase alternating current at 220 volts and 30 cycles is supplied from the power station. A battery in a room immediately below the main board may be charged from either supply; there are 112 cells of the E.P.S. central-station P type, having a normal discharge rate of 40 KW. at 220 volts. There is also a battery of six cells for obtaining currents up to 600 amperes at pressures from 2 to 12 volts.

The main switchboard, of seven panels, was erected by Messrs. Siemens Bros., of Stafford. It is equipped with various makes of instruments and starters, so that the students may see them working side by side and compare the methods employed to attain the same end. As an instance, there are seven meters of five different makes. Primarily this switchboard is intended for the battery charging, but it also serves to obtain from the batteries various constant supplies which are distributed throughout the laboratories.

The main battery is charged from the D.C. 110-volt supply by a 28-KW. motor-generator set, constructed by the British Thomson-Houston Co., of Rugby. For charging from the alternating-current supply a 30-KW. Brown, Boveri rotary converter receives the supply from an auto-transformer, and an alternating-current booster regulated by a worm and wheel.

In the case of the 220-volt D.C. supply, the variations of battery pressure are compensated by means of a reversible booster with Thury regulation. A 30-KW. motor-generator set, by Messrs. W. H. Allen & Co., of Bedford, enables a 220-volt supply to be obtained while charging the battery, the exact pressure being regulated by the booster.

To give a 50-cycle alternating supply, a motor driving a 25-KW. alternator at 750 R.P.M. is run from the 220-volt supply. This set is by the Brush Co., of Loughborough.

A 30-cycle alternating supply is obtained by running the converter from the D.C. side.

Another set consists of two motors and two alternators by Messrs. Parker, of Wolverhampton. A "Castle" type of D.C. motor with interpoles coupled to a Holmes-Clayton alternator (30-50 cycles star or mesh connected) has recently been installed.

On the same side, but at the north end of the main laboratory, are testing beds arranged to take any class of small motor. The requisite supply can be obtained from special switchboards. Machines of various makes are in use here, including a Rosenberg train-lighting dynamo, a Winter-Eichberg motor, giving a shunt characteristic, and a Deri single-phase commutator motor.

There are two artificial lamp loads: one for direct current up to 220 volts, of 7 KW. capacity; the other of 30 KW. capacity, for direct, single-phase or three-phase currents. At the north end of the laboratory is the workshop, which contains tools for the making and repair of apparatus and fittings required by the department. The eastern side of the laboratory is provided with benches where transformer work, cable tests, and instrument and controlling gear testing may be carried out.

Close to the switchboard is a standardising room, where any of the instruments used may be standardised; if necessary, this can be done when they are in position, by connecting up to "test" terminals provided on each board. Here also is a Duddell oscillograph, and a portable ondograph has recently been acquired for carrying out tests on the wave forms of the machines.

A museum contains samples of essential materials for the construction of electrical apparatus, besides many spare parts for small machines. An interesting exhibit is the first Edison "Z" type machine constructed. Important firms are showing their appreciation of the work done, or likely to be done, by the University by lending machines, instruments, meters, lamps, &c., which are tested by the students. In order that the lectures may be practically illustrated, mains from each supply are led to switchboards, both in the small electrical lecture room and in the large lecture theatre.

The Chemistry and Physics blocks are to contain electrical installations of an elaborate character, so that electrochemistry and the more theoretical side of electricity may be fully demonstrated and studied.

The fact should not be overlooked that in the set courses for engineering students, instruction in accounting, more especially as applied to engineering, is compulsory. This is a most important point, and will, no doubt, meet with the approval of all commercial engineers.

## "C.M.B." PATENT DIRECT CURRENT ROTARY TRANSFORMER.

By J. C. MACFARLANE, M.I.E.E., Wh.Sch., and H. BURGE, A.M.I.C.E., A.M.I.E.E.

IN the following paper the construction is described, and several applications discussed, of a new type of rotary electric transforming machine developed by the authors, for reducing supply voltages for the economical working of metal-filament and arc lamps, for battery charging, gun-fire, and navy-phone circuits, and also for balancing three-wire circuits.

The lines along which this machine has been developed are easily followed by reference to figs. 1, 2, &c.

Fig. 1 shows an ordinary two-pole dynamo-electric machine in which $n$ and $s$ represent the field poles, and $a$ $a$ the main brushes. If cross brushes $b$ $b$ are placed on the commutator and short-circuited, and if the primary supply voltage is represented by P, then this may be reduced to any desired value represented by S, depending chiefly on the position of the short-circuited brushes $b$ $b$ on the commutator in relation to the main brushes $a$ $a$.

The machine as shown in fig. 1 would have several serious defects, viz :—

1. The presence of the iron poles $n$ $s$ immediately over the shorted brushes $b$ $b$ would not permit of sparkless commutation at these brushes.

2. It would not be possible to regulate the secondary voltage S, either automatically or by hand.

3. The MMF. of armature reaction would cause a large cross flux to pass through the armature between the shorted brushes across the pole faces, as shown by dotted lines in fig. 1. The armature revolving in this flux would create a large circulating current

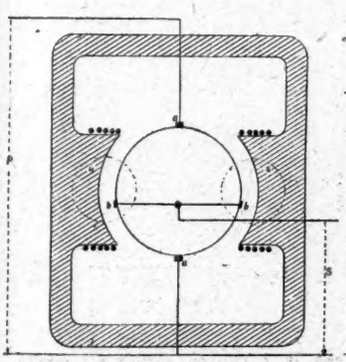

FIG. 1.

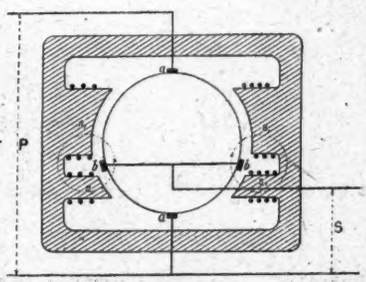


FIG. 2.

in the shorted brushes—either causing the machine to race dangerously or lose speed. Such a circulating current would also be very wasteful, and would tend to make one of the short-circuited brushes spark more than the other.

4. The weight of the field magnets and space occupied would be excessive.

The method adopted to get over the sparking difficulty has been to sub-divide the poles into two parts, to correspond with the position of the shorted brushes. This step is shown in fig. 2, where the poles are shown divided unequally, as would be required for an unequal division of the voltage.

It will be noted that when the EMF. applied to brushes $a$ $a$ is to be split unequally, the field should be divided unequally, and the shorted brushes should divide the armature in a corresponding manner, as this will lead to greater efficiency and economy in material. In reducing from a constant potential of 220 to a constant potential of 50, say, the part pole ratios should be approximately 2 : 1 for maximum economy.

If the supply voltage is constant, and the speed of rotation is to remain unchanged, any increase of flux on one side of the shorted brushes must necessarily take place at the expense of the flux on the other side. In order to regulate the secondary voltage, therefore, or compensate for voltage drop in the converter, the authors provide the machine with a ring wound armature, and entirely isolate the two magnetic circuits from one another. It should be noted that it is quite impossible to get any regulation of the secondary voltage without absolutely isolating the one magnetic circuit from the other, and also impossible to prevent wasteful circulating currents in the shorted brushes. It is obvious that the machine in fig. 2 would be unsatisfactory for two reasons; firstly, because any reduction in the MMF. on poles $n_1$ and $s_1$ say, and a corresponding increase in $n_2$ $s_2$ would have no effect on the quantity of flux passing through the two parts of the armature, thus preventing any alteration to the division of voltage; secondly, the armature reaction flux has still a low resistance path, as indicated by the dotted lines in this figure.

As mentioned above, a variation of the voltage on either side of the shorted brushes cannot take place unless a ring armature is used, due to the fact that the armature conductor of a drum armature spans across the pole pitch.

The construction adopted for completely isolating the magnetic circuits, shown diagrammatically in fig. 3, consists primarily in placing the pole parts $n_1$ $s_1$ $n_2$ $s_2$ in a vertical position with

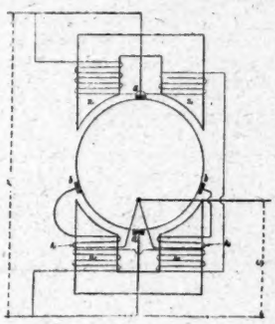

FIG. 3.

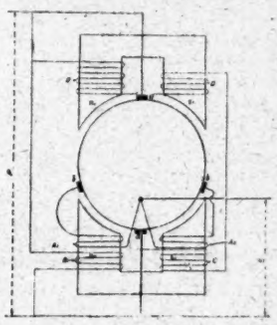

FIG. 4.

relation to the plane passing through the shorted brushes. It will be seen from the diagram that the length of the mean resistance path for the flux, due to the armature MMF., is increased considerably, and that as the yoke length is shortened the weight and cost must be considerably reduced.

Although all the precautions as outlined above were taken in the earlier designs, these machines still gave considerable trouble, due to the short-circuit current flowing through the armature across the shorted brushes. As already stated, this short-circuit current, if not properly controlled, makes the operation of such a machine practically impossible, and it was found in the earlier machines referred to above that there was a very great liability for the machines to take charge and race dangerously, more especially when the secondary voltage was varied between wide limits. This, of course, is due to the fact that the armature reaction, caused by circulating current in this case, may be in direct opposition to the MMF. on the main field poles, resulting in a demagnetisation of these poles, and raising the speed.

To get over this difficulty in the most effective and simple manner possible, the poles are provided with series windings in addition to the ordinary shunt coils, and connected as shown in fig. 3, where $A_1$ and $A_2$ represent the series coils. These coils are each connected to one of the shorted brushes and their other ends connected together at one of the secondary terminals of the machine. Under normal circumstances, when there is no circulating current flowing through the armature across the shorted brushes, then each brush and each main coil will be carrying half the secondary load current; if, however, a circulating current arises, it will flow in opposition to the load current in one coil $A_2$, say, and in conjunction with the load current in the other coil $A_2$. In effect, therefore, the current in coil $A_1$ will be less than in coil $A_2$, and if these coils are suitably coupled up, will have the effect of correcting or preventing the short-circuit current from rising to any considerable value. In other words, as the current in the coil $A_1$ is less than the current in the coil $A_2$, the MMF. on pole $n_2$ is less than the MMF. on the pole $s_2$, and this tends to cause a greater voltage to be generated under the pole $s_2$ than under the pole $n_2$, thus opposing the voltage which is creating the circulating current.

A little consideration will show that these balancing series coils can be placed on all the poles, and can be wound, not only to effect the governing of the circulating current, but also at the same time to create either a compounding or differential effect on the secondary circuit.

When these series coils are used, there is no tendency for the machine to race, and the currents coming from each of the shorted brushes are always within 10 per cent. of each other, even when the magnet poles are entirely unsaturated, which would be impossible without these windings.

These converters may be divided into three classes, depending on the use to which they are to be put:—

(*a*) For giving a constant secondary voltage for any value of the secondary current.

(*b*) For giving a secondary current which is to remain approximately constant for a given range of secondary voltage.

(*c*) Machines which are to be used for converting from alternating to direct current, the direct-current voltage being capable of variation without affecting the power factor of the alternating side.

As a general rule, the coupling diagram, as shown in fig. 3, is

suitable for machines giving constant voltage. Such machines would be the direct-current equivalent of an alternating-current auto-transformer, but would have the advantage that the secondary voltage could be easily altered at will, independently of the primary voltage, or compounded for voltage drop. As machines of this class, having a capacity of between 2 KW. and 3 KW., will have an efficiency of from 75 per cent. to 80 per cent., it is obvious that their application to transforming the voltage for metallic-filament lamps, has led to very good results in many cases.

For instance, in large shops, hotels and theatres, when the full load can be switched on at once, and kept on for a considerable time, the saving will be something like 70 per cent. in power over the most efficient carbon lamp.

The secondary voltage can be made to vary up or down, either automatically or by hand regulation, to suit the various conditions to which the machines may be applied.

In all the above cases it is desirable to arrange the values of the ampere turns on the poles on both sides of the shorted brushes, so that both poles and yokes are unsaturated magnetically. This permits of good regulation and perfect governing for short-circuit current.

With the poles on the primary side of the shorted brushes, viz., $n_1$ $s_1$, absolutely unsaturated magnetically, and the poles on the secondary side highly saturated, it is possible to use this machine by applying a fly-wheel to its shaft, for reducing the voltage from a tramway trolley circuit to, say, 220 or 110 volts, and, at the same time, to smooth out the variations in voltage on the secondary side, so that the machine can be used for supplying incandescent lighting successfully from its secondary terminals. With the usual variation of pressure of a tramway circuit, a practically constant voltage can be obtained at the secondary terminals of the machine.

The machines have also been applied to balancing three-wire circuits with great success, the largest as yet made being two machines for the Calcutta Electric Supply Corporation, dealing with an out-of-balance load of 60 KW. on either side of the middle wire, the voltage of the outers varying from 460 to 580 volts. These machines were required to balance the voltage within 1 per cent. of the mean value on either side of the middle wire at all voltages between 460 and 580. Their efficiency was 94 per cent. on test, which is 4 per cent. or 5 per cent. higher than that obtained with double machines.

The advantages of using such machines as balancers are the small weight and space taken up, absolute reliability, small wear and tear on the brushes and high efficiency.

When used as a balancer, the armature is divided into two equal parts by the shorted brushes; also the polar limbs are all equal in dimensions, the series compounding coils are arranged on all the poles, not only for the purpose of voltage regulation, but also to balance the circulating current across the shorted brushes.

From the foregoing it will be seen that there is an unlimited field for the use of this converter, owing to the high efficiency and small space required.

We will now describe briefly the construction of the machine used for the purposes set forth under heading (*b*), having a constant secondary current over a given range of secondary voltage. The characteristic of the secondary is shown by the curve in fig. 5, and is suitable for supplying a single arc lamp, or two or more arc lamps in series, without the use of steadying resistances.

Fig. 4 shows the winding diagram of the machine arranged to give automatically a practically constant secondary current. On examining this diagram it will be noticed that the shunt windings on the part poles $n_1$ $s_1$ are connected between the positive supply main and the shorted brushes, whereas the shunt coil marked B is connected right across the supply mains. The shunt coil C is connected between the shorted brushed and the negative supply main. The series coils $A_1$ $A_2$ on the part poles $n_2$ $s_2$ are each connected to a shorted brush, in the same way as described with reference to fig. 3, but in this case the series coils $A_1$ $A_2$ are so connected that their M.M.FS. oppose the M.M.FS. of the shunt coils B and C. The action of the machine is as follows:—

If the secondary current tends to increase, the opposition M.M.FS. of the series windings $A_1$ $A_2$ are increased; which reduces the secondary voltage s, the presence of the separately excited coil B preventing the flux in the poles $n_2$ $s_2$ being wiped out altogether. The secondary voltage having dropped, the voltage between the shorted brushes and the positive main brushes must rise, causing the shunt coils D to increase the flux through the part poles $n_1$ $s_1$, thereby replacing the flux withdrawn from the part poles $n_2$ $s_2$, and so keeping the speed constant.

When under load the armature is divided into a motor portion and a generator portion by the shorted brushes, and the M.M.F. of the motor part will be in opposition to that of the generator part. With a certain transformation ratio these M.M.FS. are equal and opposite, but in the case of the arc lamp converter just described, on approaching the short-circuit condition the M.M.F. of the generator portion is much greater than the motor part, and a cross flux already referred to passes between the shorted brushes, following the path shown by the dotted lines in fig. 1, causing a large parasitic current to flow between the shorted brushes. This cross flux can be neutralised by strengthening the M.M.F. in the pole $n_2$ and weakening $s_2$, and the parasitic current traversing the coils $A_1$ $A_2$ performs this function to a great extent; but to entirely neutralise the cross flux the authors place the shunt coil B, which maintains its strength throughout, on the pole $n_2$, and the coil C—which becomes gradually weaker towards short-circuit—on the pole $s_2$.

These machines are absolutely automatic in their action, and will run for any length of time on open circuit, full load, or with the secondary terminals of the machine short-circuited, for any length of time. They can be worked with perfect safety to the operator, and no damage can be done to the lamp, as the current can never exceed the full-load working current. In cases where the lamp has to strike automatically, this is insured by the fact that when the carbons are brought together there is an instantaneous rush of current of about twice the full load working current, which makes the lamp strike. This current settles down to the full load value in less than a second, and if the lamp does not strike, the machine merely allows normal current to pass through the shorted carbons.

A variation in the secondary characteristic can be produced by inserting a shunt regulator. Similarly, a constant current of practically any value, covering a very wide range, can be obtained for a given range of voltage by merely fixing the position of a shunt regulator handle.

Fig. 5 shows some actual curves taken from a test on a machine. The curve 1 is vertical, and one might suppose there would be instability when working on the vertical part of the curve. This is not the case, as it is quite possible to arrange these machines to work two arc lamps in series. When one lamp only is working, the other being short circuited, the machine is quite stable, and supplies the remaining lamp satisfactorily with the same current, but at a lower voltage. As far as the authors are aware, this is the first time such a result has been obtained.

The various characteristic curves as shown in fig. 5 are produced by altering the resistance in circuit with the shunt coil B, and this being an extremely simple thing to do, such a machine is specially adapted for working a cinematograph, and in fact any kind of projector lamp, because of the ease with which the light intensity can be altered by adjusting the amount of current passing through the arc, 50 per cent. above or below the normal.

It is possible with such a machine to place it at a long distance from the operator, and merely bring two small wires to the shunt regulator at the operator's hand; any alteration to the intensity of the light can be obtained by adjusting the shunt regulator handle.

A cinematograph machine capable of giving a supply of 50 amperes to a 50-volt arc is 22 in. high × 21 in. wide × 14 in. long, and weighs 5 cwts. The efficiency of such a machine works out at from 75 per cent. to 80 per cent. on full load, and it will, therefore, save, when replacing a steadying resistance worked off a 440-volt circuit, about £13 per week; when replacing a steadying resistance worked off a 220-volt supply, some £5 per week, and when replacing

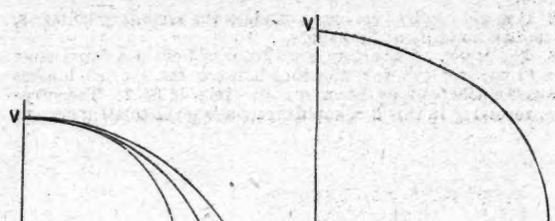


Fig. 5. Fig. 6.

a steadying resistance worked off a 110-volt supply, the saving will be about £1 10s. per week. These figures are based on the assumption that the price of current is 3d. per unit, and that the lamps are used for 50 hours per week. The price paid for such an installation, working on these assumptions, will be saved, in the first case in four weeks, in the second case in about 10 weeks, and in the third case in about 35 weeks.

In electric welding any of the characteristics shown in fig. 5 will be suitable. The primary supply voltage should be low, for the machine can be made rather lighter, more efficient, and of better proportions, the lower the primary supply voltage.

A very good portable welding set could be made by supplying in conjunction with such a machine, an 80 or 90-volt battery capable of giving high discharges for short periods.

Fig. 6 shows the relationship between the secondary amperes and voltage of a 220-volt machine made for the purpose of supplying two 120-ampere 60-volt arc lamps in series. The efficiency of this machine, when supplying the two lamps in series, was over 92 per cent. The dimensions of the machine are 24 in. high × 22 in. wide × 24 in. long, and it weighs 8 cwt. net.

The weight of the set, and the space taken up, have probably never been reached before within 100 per cent.

The weight and the space taken up are remarkably small, when it is considered that each part of the armature, and each part of the field system has to be capable of dealing with the full primary voltage and the full secondary current at the same time.

Under heading (3) are machines which are used for converting alternating currents to direct currents; these are really the machines which come under headings (1) and (2), supplied with a suitable number of collector rings to suit the number of the phases of the supply. The advantages to be obtained by using such machines for this purpose are as follows:—

The direct-current voltage taken from the secondary is more or

less independent of the alternating supply voltage, and can be varied either automatically or by hand without altering the power factor of the alternating current supply to any appreciable extent. It is evident, therefore, that machines of this kind can be used for all the purposes set forth under headings (1) and (2) by applying similar windings to the part poles $n_1$ $s_1$ and $n_2$ $s_2$, and when supplied with collector rings and a belt pulley this machine is extremely valuable for teaching purposes in technical colleges.

With the cross brushes up such a machine can be used as a direct-current dynamo, a direct-current motor, an alternating-current dynamo, an alternating-current motor, a combined direct and alternating-current dynamo, or a split pole rotary converter. With the cross brushes down it can be used as a direct-current auto-transformer, converting if desired from constant potential to constant current, and again as a rotary converter, converting from alternating to direct current of practically any voltage between given limits.

## THE TECHNICAL PRESS.

THE following interesting remarks, reprinted from an American exchange, were made by Mr. Hugh M. Wilson, late manager of the *Railway Age* (U.S.A.), at a testimonial dinner recently given to him at Atlantic City :—

"I am proud of the fact that I have been a newspaper man and a publisher. I am proud of the fact that I have been connected with the railway and technical press. I am yet more proud of the friends and acquaintances which that connection has brought to me. I am inclined to think that the functions, the opportunities and the merits of the technical press are not as fully understood and appreciated as they should be. Nor is the ignorance in this respect confined to readers and patrons; some editors and publishers are among the guilty.

"One of the greatest menaces to public sanity and public morality in this country is the jaundiced irresponsibility of a large section of the daily press and of many popular magazines. Under the guise of upholding public morality they are following a policy of commercialism that is frequently conscienceless and that is always dangerous in its tendencies. A great popular journal is not now a great moral force; it is a great commercial enterprise which exploits the poorer classes of the people. As money makers, as manipulators of the public for profit, our 'railway barons' and our 'captains of industry' are mere babes and sucklings in comparison with the men at the head of some of these journals of general circulation. These plutocratic publishers, these moulders of public sentiment, make their money out of advertising patronage—which they can command by reason of enormous circulations. Great circulation is not always compatible with editorial decency and self-respect. These circulations are built, not upon the accuracy of what the papers print, not upon the soundness of the views they express, not upon the mental and moral healthfulness of the information they disseminate, but upon the degree to which the 'human interest' of the reader is stimulated and held. The appeal to the element of human interest is the controlling factor in the business and editorial policies necessary to large circulations. It ruthlessly demands startling 'stories' and picturesque distortions of facts. The truth is nothing; the interest, the thrill, the heart-beat of the reader is everything. Here is a condition that, aggravated by the complexity of modern existence and by the diversity of human knowledge, makes accuracy of statement and the setting forth of facts in their true relations impossible, and, for the purpose of the sensationalist, undesirable. Furthermore, the specialisation of endeavour in all lines of business and thought renders it most difficult for even the best-intentioned editor of a daily paper to do justice at all times. A writer, however facile and quick of comprehension, must be in the atmosphere of things in order to write of them with due regard to truth and proportion. The fundamental facts underlying industrial affairs are elusive, and in times of popular excitement are easily lost to sight. They are liable to be swamped in tides of popular prejudice and plausible special pleading.

"Such, briefly, are the conditions out of which spring the opportunities and the grave responsibilities of the technical press. It should be the work of the technical journalist to rescue the business interests of this country from the riot of ignorance, untruth, half-truth, distortion of facts, sensationalism and crooked thinking—the whole brood of abuses that yellow journalism has introduced into the treatment of serious business affairs. The technical journal may lose much of its force; it may fail of the full performance of its duty; and it may squander its great opportunities by being too narrow in its scope. On the other hand, the readers and the patrons of these journals may make the mistake of minimising their functions and misunderstanding their mission.

"The day has gone when a technical journal can be looked upon as an instrument of charity, as a means for helping the publisher just because he needs the money. It is folly to look upon it as a mere scheme of questioned legitimacy. Likewise it is unprofessional and it is business suicide for the publisher to render only so much service as will enable him to pull the thing through with a satisfactory profit. He must deliver the goods; and when he does deliver the goods, he is entitled to rewards commensurate with the quality of the goods and the completeness of the delivery.

"I think that there is a tendency to make these papers too exclusively technical. I do not mean that the text should be less thoroughly scientific; I mean that the editor should keep in mind the vital fact that while an engineer, for instance, should be a technologist, he cannot be a really great engineer unless he is also a man of affairs. The technical journal of the first class is the companion of the mature man, not of the schoolboy. The engineer, the railway manager, the manufacturer, or the artisan in the shop, who is doing his work in the world is a human being, and oftentimes he is a statesman. To expect this sort of a being to be content with cosines and tangents, with cold-hash reprints, with complex formulæ, with terrifying terminology, with theoretical abstractions, and with these things alone, is a pathetic joke. And the worst of it is, he will refuse to be content with them. These men want practical engineering work, and the activities of their several callings described, discussed and interpreted not alone technically but also in the terms of the social, economic and political purposes of that work and those activities. Engineering and business problems in the final analysis are not mere problems in mechanics or mathematics. They are problems of society; they are problems the solution of which involves the welfare of the human race.

"These considerations, I believe, sanction the proposition that the future of this country, the sane solution of some of its gravest questions, should be powerfully influenced by our technical press. And let me remark in passing that a somewhat extended familiarity with technical journals in other countries, as well as with those at home, impels me to say that our technical and trade journals lead the world. Our large public questions are to a remarkable degree of an industrial nature. The interworkings of political, economic and business forces were never so pronounced in any nation as they are with us to-day. There never was a time when straight thinking, candid investigation, and courageous speaking, were so much needed as we need them now. And they are needed not alone for the regeneration of the common mob. Many magnates have maggots. In my judgment it is the business of the technical journal to take a larger share in this work than it has done hitherto. It should broaden out, and in its endeavour to broaden out it should have generous co-operation.

"Among the technical journals of the country there are none more worthy than those devoted to the railway industry And there are none upon which so great a responsibility rests. The railway problem has almost infinite ramifications, and the railway business is one of infinite complexity. This variety and breadth of interests defines the scope of the journal that would cover them.

"It requires more men, more brains and more money to make a good railway journal than is required to make an equally good paper in any other field of which I know.

"Whatever may be said in derogation of American railways, the fact remains that they constitute, and for the last half-century have constituted, the greatest force in American political, social and material development A foreign observer who visited this country just prior to the meeting of the International Railway Congress at Washington in 1905 made the remark: 'I am not surprised at what you have done here, but I am amazed that you should have done it all in 200 years.' It is the railway that has compressed into one century the accomplishment of ten centuries. The achievements of railway enterprise is the standard by which railway journalism must be and will be measured."

## OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"E. P." writes:—"A certain supply authority (municipal) has advised its consumers that from a given date the price of current will be raised from what is now averaging 3 8d. per B.T.U. to 8d. flat rate (owing to the use of metal-filament lamps). The circular reads as though it is only applicable to 'those who have installed transformers.'

"(*a*) Can such discrimination be legally made?

"(*b*) In the event of a mixed system, carbon lamps; series wiring and M.F. lamps; and transformers and M.F. lamps, can the supply authorities make separate charges and demand three meter rents?"

*** This query raises a point of some interest. Where a supply of electricity is provided in any part of an area for private purposes, then, except in so far as is otherwise provided by the terms of the provisional order, every company or person within that part of the area shall, on application, be entitled to a supply on the same terms on which any other company or person in such part of the area is entitled "under similar circumstances" to a corresponding supply (Electric Lighting Act, 1882, sec. 19). The same Act provides (by sec. 20) that undertakers must not, in making any agreement for a supply, show any undue preference to any local authority, company, or person. Subject to this, they may make such charges for the supply as may be agreed, not exceeding the limits of price imposed by or in pursuance of their provisional order. They cannot prevent any particular form of lamp or burner; but a consumer must not use any lamp or burner which is likely to interfere with the supply to other persons (sec. 18). It is clear, in the first place, that the use of a transformer and metallic-filament lamps by one consumer interferes in no way with the supply to other consumers. That proviso may therefore be eliminated from the discussion. Two further points arise: (*a*) Is supply to a consumer using a transformer and metallic-filament lamps supply

"under similar circumstances" to ordinary supply? (*b*) Is a rebate to ordinary consumers an undue preference? If there had been no section in the Act of 1882 to prevent the company prescribing any particular form of burner, it might well be argued that the use of a transformer was user "under other circumstances." But in view of the fact that this proviso is there, the Act must be interpreted accordingly. As to "undue preference," it would seem that a company which specially favoured the use of ordinary lamps would give them undue preference. Metallic-filament lamps were not in use when the Act was passed; and if their user has made it more difficult for the supply company to make a profit, so much the worse for the supply company. This opinion is advanced on general principles, and without reference to any decided case. It would be extremely interesting to hear the result of a test case in the High Court.

## NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

### A Loud-speaking Telephone Receiver.

MR. N. D. BLAGDON PHILLIPS, whose loud-speaking receiver was described in our issue of June 5, 1908, has invented a further improvement. The means by which the movement of the sound-reproducing diaphragm is amplified in the new receiver is illustrated in fig. 1, where F is a piece of ferrotype, actuated by the

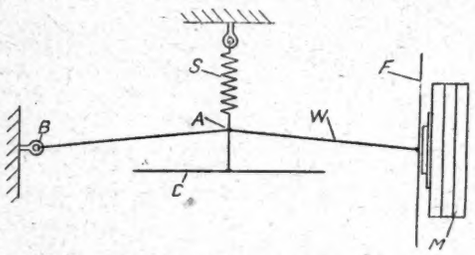


FIG. 1.

polarised electromagnet M. To F is attached a fine wire or thin strip W, the other end of which is anchored at B. About the middle of W a spiral spring S is made fast to it, as shown at A, the straightened end of the spring projecting and being secured to the acoustic diaphragm D. It will be obvious that any movement of F will, through W, cause an amplified movement of D. Fig. 2 illustrates an application of this principle; the instrument is shown in elevation, the left-hand portion being in section.

In this instrument the fine wire, which was represented by W in fig. 1, is duplicated, $W_1$, $W_2$, each operating its own acoustic diaphragm $D_1$ $D_2$ and being actuated by attachment to the ferrotype

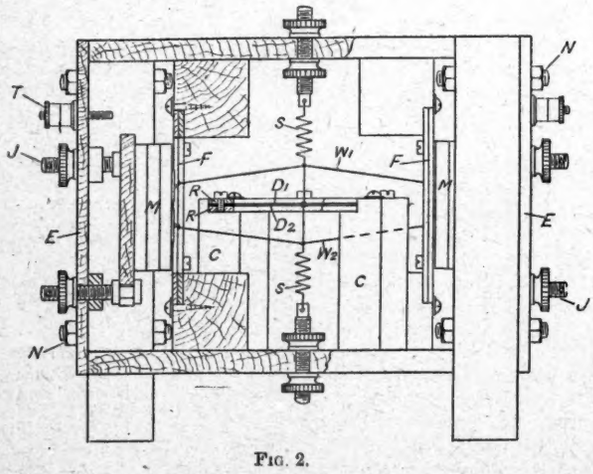


FIG. 2.

diaphragms F, F; $D_1$ and $D_2$ are in proximity, separated only by a thin annulus and clamped together by the rings R, R. A gap occurs in the separating annulus, and a nozzle is attached thereat, through which the sound is emitted. The clamping rings R, R are supported on the blocks C, C.

The polarised electromagnets M, M are adjustably mounted by the screws J on the wood bases E, E, on which are also placed the terminals T. These bases are held in position by the studs and nuts N, which allow of their being readily removed.

### Silvertown Hose: A Large Consignment.

The INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD., of Silvertown, London, E, are well known as manufacturers of hose for all purposes. The photograph here reproduced, fig. 3, is of a large consignment of hose for pneumatic drill work,—the 5-in. suction

FIG. 3.

hose at the base being for mine work in South Africa. The Silvertown Co. recently shipped two suction hoses of 24 in. diameter to South America.

### The "Facile" Multiple Switch.

MESSRS. D. H. BONNELLA & SON, LTD., of 58 and 60 Mortimer Street, W., are introducing a new switch for attachment to electric light fittings having two or more lights, which enables any or all of the lamps to be switched on at will, thus dispensing with multiple wiring to the fitting. In the case of a pendant, for example, the switch is fixed to the ball, and is provided with a handle projecting downwards; by rotating the handle slightly, one lamp (or circuit) is switched on; further rotation brings the second light into action, and so on, while a slight rotation in the opposite direction switches all the lights off with a quick-break and independent motion. The switch is fitted to floor standards, radiators, and other fittings, and serves a purpose which has hitherto been attained, only by round-about means.

## CORRESPONDENCE.

*Letters received by us after* 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

### Earth Indicating Device.

Referring to "W. H. B.'s" inquiry under the above heading in a recent issue, I think the Marlor and West Leakage Detector and Alarm is exactly what he requires. This is a differentially wound relay with its two coils carrying the main current in the circuit. A leakage on either main disturbs the magnetic balance and operates the alarm. This device, which has been designed for erection on two or three-wire installations, will very shortly be on the market.

L. H. M.

Manchester, *July 19th*, 1909.

### Discourtesy of a Selected Candidate.

We assume that the column signed by "C. I. E." in your esteemed journal, and headed "Discourtesy *to* a Selected Candidate," had reference to an interview which two of our representatives lately had in London with Mr. . . . .

We had been looking already for some time for a good "designer in switchboards and apparatus," and had decided to offer this position to a gentleman who seemed to have the necessary requirements, and whom we knew from his application to represent us in London. By a pure mistake, it had been neglected to inform him beforehand that the position which we could offer him was on the Continent. Who would describe the astonishment of our representatives when the candidate seemed furious because the position was not in England itself.

It is extremely interesting that this incident—the offer of a position on the Continent to Mr. . . . . (a foreigner

himself, as his name would indicate, and most anxious to represent a foreign firm) should be made the cause of his pleading against foreign competition.

Needless to add, that we are very glad that Mr. . . . did not accept our offer.

**The International Engineering Co.**

Liége, *July 13th*, 1909.

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### The Prevention of Smoke.

Mr. Bennis's letter, published under the above title, calls for little or no comment. Indeed, I fail to quite see the relevance to the heading under which it was printed.

My object in writing the article in question was not to show "how much steam can be got from a boiler," nor "how to burn the largest amount of fuel with a chain grate;" and I certainly do not intend to resurrect the hoary old controversy that has so often raged round the various methods of mechanical stoking, particularly as Mr. Bennis's opinion on this point must of necessity be pledged.

I am quite aware that the method I illustrated and have proved reliable in abolishing smoke, when applied to mechanical stokers, has been patented in many forms "from the early days;" but judging from the tone of Mr. Bennis's letter, the adage that there are none so ignorant as those who won't learn is still quite as true as the method given is efficacious.

The probable causes given by Mr. Bennis for the emission of smoke are evident to the merest tyro, and *are quite superficial*, and seeing that the chain-grate stoker is of the coking type, the last paragraph in his letter is quite illogical and unintelligible.

**Wilfred Yorke.**

Manchester, *July 17th*, 1909.

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### E.M.F. in a Dead Underground Cable.

I was much interested in the letter by "J. W." *re* the above, and such an experience is, I consider, worthy of being put on record.

The theory, however, of the lead sheathing acting as a pilot from an earth in another district, does not, I consider, account for the jointer receiving a shock off the lead of the cable, because, as I have already explained, the lead sheathing was entirely insulated from earth throughout its whole length, except at the point where the jointer was making contact with it.

**Enquirer.**

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### Rating and Taxing of Electric Motors.

I shall be much obliged if you, or your legal contributor, can give me some information as to the proper and legal rating and assessing of motors, steam and gas engines, and how the respective horse-powers are calculated for this purpose.

At the present time, no sooner have I got an electric motor installed in a consumer's premises, than he is met with a demand for the local rate on it, followed up shortly after by the Surveyor of Taxes with further demands; and if the unfortunate user has kept his engine connected up to the gas or steam supply for standby, as is often done for the first few months, at any rate, he finds his rates and taxes doubled.

Again, take another case where it is desired to replace a 30-H.P. steam engine by nine motors on nine separate drives of 10 H.P. each. In this case, owing to the large diversity factor, the average total H.P. required is well under 30, but the motor for each group cannot take account of this, and, therefore, the total H.P. for assessment is 90.

Taking the assessable value as £1 5s. 6d. per H.P., the rates here are at present 5s. 6d. in the £, and on a 10-H.P. motor, the rates levied are £3 8s. 9d. per annum.

This consumer, therefore, having by his conversion to electric driving, increased his available H.P. by 60, is now met by an additional rates bill of £20 12s. 6d. plus taxes, over and above his previous rates, all of which he has to save before he can get any monetary advantage from his electric driving.

I am further informed that a steam-engine user can get an engine assessed at, say, 20 H.P., which with a little speeding up, and, perhaps, increase of pressure will give 30 to 35 B.H.P.

The rates departments are so keen on their pound of flesh, that unless I can find some relief from this difficulty, power supply in this town is likely to come to a standstill just at a time when the outlook appears most favourable.

I can hardly imagine my difficulties here to be unique, and therefore hope that, through your paper, I may obtain some useful information.

I shall be glad to answer any letters from correspondents if you will kindly forward them to me, but for obvious business reasons desire for the present to remain anonymous.

**Borough Electrical Engineer (No. 3).**

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### Temperature Errors in Shunted Ammeters.

I have been much interested in the correspondence under the above title in your columns. Your correspondents, however, seem to have overlooked one important point, namely, that, while it is true that if the junction of two dissimilar metals is heated an E.M.F. is thereby produced, at the same time there must necessarily be, somewhere in the circuit, a similar couple tending to produce an E.M.F. in the *opposite direction*, its value again depending upon the temperature. The resulting E.M.F. is consequently solely dependent upon the difference between the temperatures of the "hot and cold junctions," as they are called.

For this reason the question of whether, for example, the connecting lugs are tinned or not is entirely without effect on the readings (contrary to the suggestion of one of your correspondents). Fig. 1 represents diagrammatically the state of affairs in such a case. C represents the end block of the shunt, the dotted line A the layer of tin, and B the busbar or cable connection. There will be an E.M.F. in one direction between A and B, and in the opposite direction

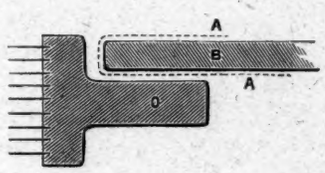


FIG. 1.

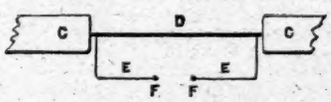


FIG. 2

between A and C, and since it is clear that both sides of A must be at sensibly the same temperature, however great may be the temperature gradient, these two E.M.F.'s will neutralise one another, and be consequently without effect on the instrument. Such equal and opposite thermo E.M.F.'s exist at a number of points in every system—at every soldered joint in fact—but as they cancel out they may be entirely neglected.

A consideration of these facts leads to a very simple means of entirely overcoming thermo-electric troubles in shunts. The arrangement is shown in fig. 2, where C C are the end blocks, D the shunt strip, and E E two strips or wires of the same material as D. Into the ends F F of these, the connections leading to the instrument are either soldered or clamped. Whatever the temperature difference between the two ends of D (on which alone the error depends), the points F F will both be at practically the same temperature, and since the circuit F E D E F is composed throughout of the same material, the resulting E.M.F. will be dependent solely on the difference of temperature between the points F F, and will, consequently, be zero, so that the ammeter remains unaffected.

While, theoretically, the wires E E should be attached direct to D, the error introduced by fixing E into the block C instead of to D direct is extremely small, since, in the first place, C and D will not differ much in temperature, and in the second, the difference, whatever it may be, is very large y

compensated by the similar difference which exists at the other end of the shunt. It is, moreover, immaterial whether the shunt consist of one strip, as shown in the figure, or of several.

In a switchboard instrument no compensation is, as a rule, found necessary, owing to the extreme smallness of the E.M.F.'s produced. As an example, let us assume the altogether abnormal difference of 100° C. between the cold and hot ends of the shunt. This difference would correspond to one end being in ice and the other in boiling water, and it seems hardly possible to conceive any conditions which could produce such a difference. In any case, if such a temperature did exist the sooner the state of affairs was discovered, owing to the false zero of the ammeter, the better. However, assuming it for a moment to be possible, the resulting E.M.F. in the case of a constantan shunt would be about 0·0035 volts, which, with a drop of 0·1 volt corresponding to full deflection, would mean an error of some 3 per cent., and, as has already been said, this could only be produced by such an utterly abnormal temperature difference as 100° C.

For many purposes, however, such as portable instruments, where the contact surface is often deficient owing to the cables used, and still more for potentiometer work, where the E.M.F.'s to be measured are frequently very small, such thermo-E.M.F.'s are of considerable importance, and have to be eliminated. Two courses are open—one being to use manganin for the shunts, as suggested by several of your correspondents, and the other to adopt the simple method of compensation described above.

**Kenelm Edgcumbe.**

London, S.W., *July 19th*, 1909.

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With reference to the correspondence in your last week's issue, I have much pleasure in supplying the information asked for by Mr. Wright.

The P.D. across the shunt in question with 10 amperes passing is approximately ·008 volt. The temperature of the hot end of the shunt was considerably below red heat, and was only just sufficient to cause the solder (which holds the resistance strip into the lug) to flow, but not enough to cause it to run out.

With regard to the letter from "W.C.," there is one point with which you do not deal in your Editorial note, namely, his reference to "tin." "W.C." evidently thinks that the solder at a mechanical joint has an effect on the thermo E.M.F. of the junction. This, of course, is quite incorrect, because the whole of the solder is at one temperature, namely, that of the junction, and cannot, therefore, produce any P.D.

In my article I mentioned that the surface of the shunt lug was not tinned, but that the copper strip conductor carrying current to the shunt was tinned. I wished to show up the fact that it is wrong to send out resistance shunts with untinned lugs, because purchasers would not care to tin them themselves, and so risk spoiling the shunt by heating it. It is well known that copper surfaces untinned will not remain permanent for any length of time. In this particular case, if the shunt lug had been tinned, the serious heating at the joint would have caused the solder to melt and so automatically seal itself off by soldering the two surfaces together. I should think that it would be better so to design shunts that bad contacts are hardly possible, rather than to leave the contacts in a dangerous state, and provide resistance material which may have no thermo-E.M.F. with copper.

**W. Fennell.**

Wednesbury, *July 19th*, 1909.

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### Municipal Trading and the Electric Lighting Acts (Amendment) Bill.

I notice in your last issue that there is another letter from "Contractor." While I admire his "bull-dog pertinacity," I really think it is time to let the matter drop. Someone must have the last word, and I think it is usual for the writer of the article to reply finally to his critics.

With regard to the constitution of the House of Lords, it seems almost unnecessary for me to detail it. It is, however, obvious that the landed proprietors, brewers, railway magnates and capitalists, who go to make up the House of Lords, are not the people to have much sympathy with local authorities. In any case, the matter was disposed of very airily in the Lords, and the Bill was left, as I pointed out in my article, in a totally unworkable form. The formidable list of amendments to the Bill, as published in your last issue, proves my contention that the turn of the local authorities and those practically acquainted with the working of municipal trading concerns, would come in the Commons.

Regarding the compulsory shareholder argument, which is always trotted out on these occasions, I think it worth while to point out that a ratepayer has as much control over the policy of a local authority as a shareholder has over that of a company; both are in the same position; if they do not like the policy adopted by the majority, they must clear out or put up with it. There is this difference, however, that it is possible, and indeed quite usual, for one or two directors to have in their own nomination a controlling number of shares, so that they dominate the company and force their policy upon other unwilling shareholders. With a local authority, councillors cannot vote themselves into power, and must meet the electors every three years. It follows, therefore, that the policy of the local authority is that of the majority of the ratepayers, whereas the policy of a company may be controlled by one man permanently. It must be taken, therefore, in the absence of evidence to the contrary, that where there is a municipal electric wiring department it is being carried on with the knowledge and approval of the majority of the inhabitants of the town in question. I have already shown that the contractors' compulsory contribution towards that department lies somewhere between 4s. 2d. and zero, and will usually be a negative amount, or, in other words, the "Ratepayer Contractor" will receive a small dividend. It is foolish, therefore, to say that the contractor is forced to provide the money which is used to compete against him, as in the ultimate event his dollar would not go very far in establishing a wiring department.

With regard to the misquotations, I showed in my last letter, in italics, the words "Contractor" had missed. I explained their importance and must leave "Contractor's" action to the judgment of your readers.

With regard to his 10 per cent. loss absurdity, I can only repeat that I quoted in my last letter the actual words on the subject from my article. I am pleased to remark he now writes correctly about an *outside* loss, instead of an *average* loss. In reply to his question, I must repeat that the basis on which I fixed a 1d. rate as the maximum of possible loss, was that of my own inside knowledge of municipal matters. I said "the wiring department usually pays, but it cannot very well cost more than a 1d. rate (if it did, the ratepayers would be up in arms)." I refuse to have anything to do with percentage losses and percentage profits. My own wiring department pays, and my Council would not wait for the loss to equal even a 1d. rate, but would close the wiring department the first year in which it did not show a profit; so that contractors in my district cannot complain of having to contribute even half-a-dollar towards the support of the department which competes with them.

With regard to contractors, I have in no way modified my position, as at the very outset I pointed out that gross cases of bad work in this district had forced us to open up a wiring department. In my last letter I pointed out that it was the bad work of some contractors that was responsible for municipal wiring departments in general, and I think other engineers will bear me out in this. I am afraid that "Contractor" is running up against one of the laws of nature, when he suggests that it is not right that the "many should suffer because of the misdeeds of the few." It is a universal experience the many pay a Police rate because of the few who break the law. We are all prevented from enjoying many of the beauty spots of England, because of the few who have abused the privileges granted in times gone by. Wiring contractors suffer to-day as a body, because those responsible for electricity undertakings will not stand by and see these undertakings ruined, just to allow the lower class contractors to have a good time at the expense of the community.

Contractors must realise that their financial welfare is, and must always be, a secondary consideration to that of the supply undertaking. If contractors are unable to deal with their black sheep themselves, the local authorities and undertakers generally will by some means or another prevent these black sheep from injuring the supply undertakings.

**Borough Electrical Engineer.**

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The discussion on the above by "Borough Electrical Engineer" and "Contractor" has degenerated into a matter as to what each said or meant or did not say or mean.

In the smaller towns in the provinces, the private contractors who do wiring, as a rule, consist of firms that were in existence before the inauguration of the public supply of electricity as cycle agents, ironmongers, plumbers, gasfitters, house decorators, hot-water engineers, &c., and have tacked electric lighting on to their other business. This statement may not altogether hold good in the cities and larger boroughs, but it is certainly the condition of things in the small towns.

In the writer's town there are three firms of house decorators, plumbers and gasfitters; two firms of cycle and motor-car engineers; one firm of cycle, motor-car, hot-water and gas engineers; and one ironmonger, that carry out wiring work, while there is not a single firm doing installation work only.

Now these private firms are in business for the making of profits or dividends, and will endeavour to sell to their clients that which most favours this object, caring absolutely nothing for the success or otherwise of the public supply undertaking.

One firm is the sole agent in the neighbourhood for a large gas engine company, and consequently it would be contrary to human nature to expect the firm to advise its clients to adopt electric driving. It cannot be disputed that electric lighting is a serious competitor with other forms of lighting and driving, and even with house decorators, for whilst the decorator was usually sent for annually before the installation of electric lighting into premises, the decorations after the installation last for many years. The writer met with a case only a few days ago where a prospective consumer of electricity was influenced by a house decorator-wiring firm, and has gone on using gas for at least another year. Perhaps "Contractor" will say what he would do in these circumstances! Surely he cannot expect that electrical engineers will calmly put up with this kind of thing!

I believe the only cure for stagnant business is for each undertaking to have powers to sell its own wares, and to exercise those powers to such an extent as is found necessary to protect its own interests.

The Bill, as amended by the House of Lords, gives power to borrow money to carry out free wiring, but, in my opinion, this is very unsound business, and the gas companies are likely to find this out before many years are gone.

In order to please a few contractors, corporations are asked to pile up debt (that everlasting bone of contention), on the installation of wires on private property when it would be just as easy in most cases to get the owner of the property to pay cash.

I have not said anything about the total incompetency of small wiring firms to deal satisfactorily with the application of electricity to driving and other purposes than lighting.

**Another Borough Electrical Engineer.**

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**Tramway Sports.**—The sixth annual sports and carnival of the Liverpool Corporation Employés' Social, Athletic and Thrift Society, were held on the Tramways Athletic Ground, Green Lane, on Wednesday and Thursday last week. The chief features consisted of the crowning of the Rose Queen (Miss Muriel Hutchinson), the ceremony being performed by the Lady Mayoress (the Hon. Mrs. Chaloner Dowdall); a decorated bijou tramcar, conspicuous upon which were a uniformed motorman and conductor, of six and four years of age respectively; a group of national dancers, and a tableau, "The Arktown Fear-nowt." The hon. president of the Tramways Employes' Society is Mr. C. W. Mallins, A.M.Inst.E.E. (general manager), who was responsible for the designing and carrying out of the carnival arrangements, and he acted as chairman of the sports committee.

## MR. BYNG'S LATEST SPEECH: A COMMENTARY.

It is the custom of the chairman of the General Electric Co., Ltd., to annually gather his handful of loyal staff-shareholders around him in Queen Victoria Street and in presence of nearly an equal number of representatives of the Press to deliver his views upon the current position of the electrical industry, as represented by the G.E.C., and to quite incidentally, of course, touch upon some other matters of wider concern. We always hear and read Mr. Byng's utterances with interest, and we believe the electrical trade will be deprived of a highly entertaining item which always comes in the summer months when other things incline to comparative dulness, if for any reason the old pilot of the G.E.C. should think he saw an error in his ways and fall into the less entertaining customs of more orthodox chairmen. We do not apprehend that we are in any immediate danger of that change taking place, and for this year, at all events, we are once again afforded the pleasure of seeing things as Mr. Gustav Byng sees them, for his speech of Monday last to his happy family is fully reported on another page of this issue. The custom of delivering speeches at company meetings is, we believe, one that is somewhat peculiar to this country, and when gentlemen from across the Atlantic have presided over the doings of Anglo-American concerns running here they have not failed to remark upon the difference. We hope that we shall long continue the custom, for although frequently meetings are mere formal affairs, the chairman being guardedly careful that nothing save an amplified statement of the already circulated report shall be vouchsafed unless he is sorely tried by shareholders, there are other meetings at which statements of supreme interest are made which are extremely useful to place on record, both for the immediate "news" purposes of the moment, and for future reference long after they have been uttered and forgotten. Mr. Byng's speeches belong to this latter class, and those who take an interest in the state of the electrical trade might do worse than spend their summer vacation sitting beside the sad sea waves beguiling themselves with copies of the Electrical Review, containing his addresses of the last six or seven years. We ourselves have spent quite an interesting hour or two with the speeches, and really feel greatly indebted to Mr. Byng for inclining us to make and take advantage of so pleasurable an opportunity.

It should be borne in mind that the results recorded by the directors of the company for 1908-9 are, as to net trading profits and income from investments, £18,448 better than they were in the preceding year. After paying 4 per cent. on its £200,000 first mortgage debenture stock, and 5 per cent. on £250,000 of preference capital, a dividend of 5 per cent. per annum is to be paid on £373,950 ordinary capital. In addition to this, in accordance with its generally prudent policy, the board has placed its additional profit to strengthening the financial position of the company by adding to the reserve account £16,145. This is wise, for in the preceding 12 months the allocation to this account was only £1,974, as fluctuations in the prices of raw materials more or less seriously affected the net result in that year. It will be observed that Mr. Byng in his survey of the past nine years shows how much greater is the margin of security for his preference shareholders than it was nine years ago. He is surprised, in presence of that fact, that the preference shares are quoted at a discount. How far Mr. Byng's apostleship of decadence, and his preachments regarding the impossibility of conducting industries here progressively and with profit, are responsible for the quotation, can only be a matter of mere conjecture, but perhaps the Stock Exchange authorities and investors can be persuaded to evaluate the G.E.C. preference capital at its just figure according to the present balance-sheet, rather than by paying heed to the opinions that may not unreasonably have obtained currency in Throgmorton Street through the circulation of the views of Queen Victoria Street. There can be small doubt that the low prices of electrical securities is responsible to a great extent for the unwillingness to put money into electrical industrial enterprises, but the reasons why electrical prices are low

is too lengthy a matter to enter into here. The G.E.C. investments in other companies stand in the balance-sheet at £61,981, and the income on these "does not vary much" and has "resulted in a return of about 10 per cent." Now these investments are partly, it seems, shares in companies selling the G.E.C. manufactures in foreign countries—France is one of them—and the tariff wall there is so high that Mr. Byng complains unceasingly about it, and this year he says the alterations are making the company very anxious. So that Mr. Byng, operating in a Free Trade country, is able to export electrical manufactures into a country which deliberately raises tariffs against him, and yet he succeeds in making a return which does not vary much from 10 per cent. We do not propose to argue the point; we only point it out as an interesting commentary on the speech reported on another page. Pressure of home competition is forcing him to seek orders more and more abroad. We are quite sure that if, on the investment in France, he can make 10 per cent., the game is well worth continuing, and in that way the departments of the works which are not now as fully occupied with business as they might be would be kept in full swing, avoiding that "waste" regarding which the speaker was so illuminating.

Really we think Mr. Byng is like his grumbling agricultural friend when, in presence of a balance-sheet which must make other companies envious, he says, "Generally speaking we cannot be dissatisfied with the year's working." Of course he is not making as high a rate of interest on his investment as he could wish. Who is? When he remarks that his profits "do not come up to the standard of profits obtained by foreign electrical companies working under similar conditions," we are tempted to ask which are these foreign companies working under identical conditions, and confining themselves to electrical manufacturing—but that, too, is too large a question to discuss here. The G.E.C. suffers "as almost everybody does, from a *general trade depression*," but the profits have been assisted by "a steady market," so that when others are looking hopefully for trade improvement, Mr. Byng can look back and remember that when trade generally was at its lowest ebb he could make 5 per cent. and an extra £18,000 for strengthening his financial position. "The working of a large commercial concern like ours shows clearly the effect of Free Trade," says Mr. Byng. It certainly is an interesting illustration!

Mr. Byng says that almost every English factory is at present being worked below its productive capacity. That is no more than one would expect when "general trade depression" has been experienced. Nine out of every ten would say "We could do more work with our existing plant." Yet in the same speech Mr. Byng told us that his telephone factory at Peel Works has had to be extended, that his new Osram lamp works will soon employ over a thousand skilled hands, that the carbon works are largely occupied, and are successfully competing with foreign firms, that batteries, porous pots and dry cells, are made at Witton, that additional plant has been put down at the tube works, that the art metal works are now making electric radiators and stoves and electric light fittings, and that, from the technical point of view, "all our works have done well," the manufacture of big plants having "greatly enhanced the reputation of the Witton electrical engineering works, strengthening their position in the foremost rank of electrical engineering firms." Again, "the working of a large commercial concern like our's shows clearly the effect of Free Trade." Really, Mr. Byng, this does not look very much like "brains and sinews now retrograding in idleness." We do not argue the merits of the question, we are merely quoting Mr. Byng.

It is interesting, in connection with this working of factories below their productive capacity, to draw attention to the remarks made by Mr. W. S. B. McLaren, the chairman of the Electrical Construction Co., Ltd. (see "City Notes" in this issue):—"During the present decade about £7,000,000 had been invested in this branch of the business, the greater part whereof was earning no dividend. . . . . Although there had been a steady and increasing outlet for electrical plant, the power to supply had been grossly in excess of the demand, in consequence of the huge increase of capital."

With a confidence which is all-inspiring, or something else, Mr. Byng demonstrating that there is nothing up his sleeve, propounds his remedy for getting something for nothing—"all this could easily be accomplished," and he is anxious for Mr. Lloyd George to know that a Budget could be framed "which would raise the production of the nation to its full capacity." Be that as it may—Mr. Byng is still at Queen Victoria Street, and there are other bidders for the Chancellorship. Mr. Lloyd George with a characteristic humour might give Mr. Byng a card of introduction to the fallen Chancellor of the Fatherland, who has found even greater difficulties in raising finances.

For the interest of our readers we have given below some extracts from speeches delivered during the last few years at the company's meetings. Some of these will be worth comparing with last Monday's speech, especially the remarks relating to the carbon factory.

*Mr. G. Byng's Speech at Annual Meeting, July*, 1903. *See E.R., July 31st*, 1903, *p.* 191.

The largest amount of the Witton deficit comes from the carbon works, and it is mainly due to what must be called unfair foreign competition. . . . . We started our carbon works because we were entirely depending upon German manufacturers. . . . We are now making carbons equal and even better in quality than the Germans. . . . . The three largest foreign manufacturers have decided to reduce their prices to a level which should be unremunerative to us, and with a view of killing the British manufacturer, are prepared to work at a loss to themselves in this country until they have achieved this object. . . . . The Admiralty, War Office, and many other Government and public bodies . . . . will support us in spite of the price regulated by such indicated foreign policy, and with this help and being able to obtain the raw material at a lower price than the Germans can obtain it, I still trust to be able to keep the carbon factory going until the time comes when the country sees the folly of free imports directed solely against the English manufacturer. This experience of ours in carbons must prove to anybody that the establishing of a new industry in this country is practically an impossibility under the present system.

In reply to a shareholder who asked, "Do you say that these Witton works will not be profitable unless we have Protection?" Mr. Byng said: "If we do not get Protection in a few years' time it will be quite impossible to keep them going, except at a great loss . . . . We are not going to stand a big loss every year for the public benefit. *The carbon works will be shut up unless we get Protection.*"

The Electrical Review in its leader dealing with this speech, wrote, "*Killed industries have a peculiar habit of coming to life again.*" This was six years ago. The carbon works, we are glad to say, are not shut, nor, judging from Mr. Byng's comment of Monday last, are they at all likely to be; Mr. Byng has protected them for himself!

*Mr. G. Byng's speech delivered July*, 1904. *See E.R., July 29th*, 1904.

Speaking of the electrical industry, of which he knew every detail, he would say that he did not believe that the users of electricity would have to pay any higher prices than they were paying now; on the contrary, if they continued free imports, the user would have to pay increasing prices, because the *competition of the home manufacturer would grow less and less.* He could submit proofs of that contention, which would show that in many instances foreigners were obtaining enormous profits through lack of English competition, and that *home competition under Protection would be so great* that it would be impossible for any manufacturer to take more than his ordinary legitimate share of profit.

*A shareholder asked*—

"Was it to be understood that the policy of the company would fail if we did not have Protection?"

*Mr. Byng replied*—

"The policy of the company was at present based on the supposition that Protection would come. If it *did not come within five years* they would have to discharge hundreds and thousands of workmen."

The five years have elapsed, the company is still proud of its achievements, and the hundreds and thousands of workmen are presumably still at work.

*Mr. G. Byng's speech, delivered at the Annual Meeting in July*, 1906. *See E.R., July 27th*, 1906.

He could not pretend to be satisfied with the profits which the company had been able to make during the last years. . . . Those who knew the inner working of the business could testify that they had no dead weight—there was not a man in their employ who was not a working man. There was not a single machine in their vast factories that did not turn and work during 53 hours of the week. There was not a space in their warehouses that was not utilised. It could not be due to any internal deficiency, to any circumstance over which they had direct control that the capital invested did not produce a more satisfactory return. There must be some other reasons, and one, to his mind, was a most important cause of the

present inability of their factories—as, indeed, of many other concerns in the country—to work at an adequate profit. Every one of the articles they manufactured had to be sold here, and everywhere, in competition with international manufacturers. These manufacturers were assisted by their Government—they were not.

At this meeting a shareholder remarked that the company was earning 10 per cent., but did not divide up to the hilt. He thought the chairman took an unduly gloomy view of the prosperity of the industry. He was glad the chairman had recovered his usual health.

We hope that the current year will be even more successful than the past has been for the G.E.C., and that in spite of all its chairman's fears for the general business of the country, he, at least, will next year be able to tell us of still further extending works, more "hands" employed, and bigger profits—to distribute as increased ordinary dividend.

## PARLIAMENTARY.

### L.C.C. Tramways and Improvements Bill.

ON Wednesday, July 14th, the Select Committee of the House of Lords, presided over by Lord Clifford of Chudleigh, commenced the consideration of this Bill. The measure has already passed the House of Commons. MR. ERSKINE POLLOCK, K.C., for the L.C.C., explained that the Bill was unopposed on various points, and he proposed to deal with that section of the Bill which authorised the extension of the tramways down Farringdon Road to a point just by Charterhouse Street. This proposal was opposed by the Great Northern Railway Co., who contended that it would cause a congestion of traffic outside their goods station in the Farringdon Road. Evidence having been given in support of the Bill, the Committee adjourned.

On Thursday, July 15th, the Committee continued the consideration of the Bill.

Evidence was given on behalf of the Great Northern Railway and the costermongers.

The Committee decided to allow the tramway to be constructed down the Farringdon Road to a point just north of Charles Street.

The case was then proceeded with for the reconstruction of the Highgate Hill tramways.

MR. POLLOCK, K.C., explained that it was proposed to acquire the existing cable line, under agreement, for £13,000, and to reconstruct it and widen the track in some parts at a cost of £41,000. The proposal was opposed by MR. T. BLOXHAM, the freehold owner of Fairseat House, which it was proposed to acquire.

Evidence having been given on either side, the Committee found the preamble proved, but were of opinion that not more of Fairseat House and grounds should be acquired within the limits of deviation than such portion as might be required for the widening of the road.

MR. POLLOCK asked to be allowed to consult his clients, and the matter was adjourned.

Other parts of the Bill which are not opposed were formally proved, and the Committee adjourned till Monday.

### Gateshead and District Tramway Bill.

THIS Bill came before Mr. Emmott's Committee of the House of Commons on Unopposed Bills on Thursday, July 15th, the object being to authorise the construction of new tramways, &c.

MR. KENNEDY (Parliamentary Agent) said the Bill had already passed the House of Lords, and had been amended to give effect to several requirements of the Local Government Board and the Board of Trade. There was, however, one clause which MR. MOON had suggested, which the promoters did not want to insert.

MR. MOON, K.C. (Speaker's Counsel) said this was a case in which the promoters, who were a tramway company, proposed to take power to substitute for their tramways the trackless trolley system, and if that was introduced, then, under the Bill, the local authority had no power of purchasing the equipment, so that their power of purchase of what was virtually a tramway was practically taken away. He pointed this out, and MR. KENNEDY said he would consult his clients as to whether they would accept an amendment giving the local authority power of purchase, but he now said they would not accept it. He had communicated with the Local Government Board in order to ascertain what the views of that department were, but unfortunately Mr. Boyce was ill, and he had not heard what their views were. He had also communicated with the authorities of the House of Lords, but they were not aware when the Bill passed through their House that the effect would be practically to discharge the power of the local authority for purchasing the equipment. He suggested that they should adjourn the consideration of the Bill until they had consulted the Local Government Board.

MR. KENNEDY pointed out that the clause in question was agreed to by the Board of Trade, and the Bill and clause were in a form which had been agreed to by the local authority, for the powers could only be exercised subject to their consent. The local authority did not want, through that Bill, to be committed to the acquisition of the trackless trolley system. The promoters had, at the request of the local authorities, excluded the clauses from the tramway provisions, and they did not want to be under the obligation of acquiring the overhead equipment. As the clause stood, the company could not install the system without the consent of the local authority, who would be able to make such conditions as they chose with regard to purchase. That would be better than tying the hands of the authority with regard to the future of this system.

The CHAIRMAN said it was no use arguing the matter that day, as they were not in a position to settle the clause.

The consideration of the Bill was then adjourned.

### Electric Lighting Acts (Amendment) Bill.

STANDING Committee C of the House of Commons sat on Tuesday (there not being a sufficient attendance on the day arranged for last week) under the chairmanship of SIR FRANCIS CHANNING, to consider the above Government Bill.

Clause (1) as follows was agreed to without discussion:—(1) "The Board of Trade may by Provisional Order authorise any local authority, company, or person, who is authorised by the same or any previous Provisional Order or by Act of Parliament to supply electricity in any area, to acquire compulsorily, or to use, for the purpose of a generating station, any land specified in the Order, whether situated within or without the area of supply, and, in the case of a local authority, whether situated within or without their district. (2) For the purpose of the acquisition of land authorised to be taken compulsorily under any such Provisional Order, the provisions of the Land Clauses Acts which relate to the purchase and taking of lands otherwise than by agreement, and to the entry upon lands by the promoters of the undertaking, are, subject to the modifications set out in the First Schedule to this Act, incorporated with the Electric Lighting Acts, as well as the provisions of those Acts already so incorporated by the Electric Lighting Act, 1882. (3) Rules made by the Board of Trade under Sec. 5 of the Electric Lighting Act, 1882, shall provide for proper notice being given of an application for a Provisional Order, by which it is proposed to authorise the compulsory acquisition or use of land for the purpose of a generating station, to owners, lessees, and occupiers of land, and also for public notice being given of the proposal by advertisement."

Clause (2) was as follows:—"It shall not be lawful for any undertakers after the passing of this Act, except with the consent of the Board of Trade, to construct any generating station on any land acquired by them after March 31st, 1909, unless the construction is authorised and the land is specified in a special Act or Provisional Order, and the Board of Trade shall not in any case give such consent until notice has been given, by advertisement or otherwise, as the Board of Trade may direct, to owners and lessees of land situate within 300 yards of the land upon which the generating station is to be constructed, and an opportunity has been given to those owners and lessees of stating any objections they may have thereto."

MR. A. H. SCOTT moved, after the word "direct," to add "to the local authority of the district in which the land is situate, and"—

MR. H. J. TENNANT, the Parliamentary Secretary to the Board of Trade, who is in charge of the Bill, asked the Committee not to accept the amendment, which he said was, he supposed, moved in the interests of the inhabitants of a district. The Government did not think it was necessary to give notice of the erection of a generating station to the local authority specifically. If the clause was left as drafted, local authorities would have all the protection they required in their capacity as owners of land.

MR. SCOTT said he considered it very necessary that those notices should be sent to the local authority. MR. TENNANT remarked that his hon. friend's purpose was really met by the words in the clause "to owners and lessees of land." That would include local authorities, where they were the owners of parks or other lands.—The amendment was carried.

Mr. Scott next moved to delete the word "land" from the clause and insert "dwelling houses." Mr. Tennant said the amendment was really a restrictive one. Surely where there were dwelling houses there must of necessity be land?—The amendment was by leave withdrawn.

MR. SCOTT then proposed to substitute the words "such local authorities" for the word "those" in the clause, and it was agreed to.

MR. SCOTT moved to add to the clause, "This section shall not apply to any station for transforming, converting or distributing electrical energy." MR. TENNANT accepted the addition on behalf of the Government, and the clause, as amended, was agreed to.

Clause (3), as follows, was adopted without discussion:—"For the purpose of enabling electricity to be brought into an area of supply from a generating station belonging to any undertakers outside that area, the Board of Trade may by Provisional Order apply to any roads, railways or tramways situated outside that area the provisions of the Electric Lighting Acts which authorise, or enable the Board of Trade to authorise, the breaking-up of any road, railway or tramway, so far as those provisions do not already so apply: Provided that a Provisional Order authorising the breaking-up of roads outside the area of supply shall not be granted by the Board of Trade except with the consent of the local authority in whose district the road is situate, unless the Board of Trade in any case in which the consent of any such local authority is refused are of opinion that, having regard to all the circumstances of the case, such consent ought to be dispensed with, and in

that case they shall make a special report to Parliament stating the grounds on which they have dispensed with the consent."

Clause (4) is as follows:—

(1) The Board of Trade, unless they are of opinion that, by reason of the character or magnitude of the proposed undertaking, the matter ought to be dealt with by private Bill, may by Provisional Order—

(*a*) Authorise any local authority or company to supply electricity in bulk;

(*b*) provide for any supply so authorised being compulsory; and

(*c*) make such other provisions as appear to them necessary for adapting the Electric Lighting Acts to any case where a local authority or company are authorised to supply electricity in bulk, including the application to roads, railways, and tramways along the route along which lines are authorised to be laid for the purpose of giving the supply in bulk of the provisions of those Acts which authorise or enable the Board of Trade to authorise the breaking-up of any road, railway, or tramway.

(2) If the Board of Trade refuse to grant a Provisional Order under this section, on the ground that the matter ought to be dealt with by a private Bill, the notices published and served for the purposes of the proposed order shall, subject to standing orders, be held to have been published and served for a private Bill applying for similar powers:

Provided that the applicants for the order shall by notice served in the prescribed manner and within the prescribed time inform all opponents of their intention to proceed by way of private Bill, and, subject to standing orders, the application for a Provisional Order shall be deemed and taken to be a petition for leave to bring in a private Bill, and the applicants shall also give such additional notice (if any) as may be required by standing orders.

(3) The Board of Trade may, if they think fit, by order authorise any undertakers to supply electricity in bulk to any other undertakers upon such terms and subject to such conditions as may be specified in the order, if the supply can be given without breaking up any streets except such as the undertakers giving or the undertakers receiving the supply are authorised to break up; but the Board of Trade shall not in any case make such an order until notice of the intention to make the order has been given by advertisement or otherwise as the Board of Trade may direct, and an opportunity has been given to any person who appears to the Board to be affected of stating any objections he may have thereto.

Mr. Scott proposed the addition of the following words at the end of Sub-section (*c*):—"Provided that a Provisional Order authorising the breaking-up of roads outside the area of supply of the local authority or company by whom the supply is to be given shall not be granted by the Board of Trade except with the consent of the local authority in whose district the road is situate, unless the Board of Trade in any case in which the consent of any such local authority is refused are of opinion that, having regard to all the circumstances of the case, such consent ought to be dispensed with, and in that case they shall make a special report to Parliament stating the ground on which they have dispensed with the consent."

Mr. Tennant expressed his willingness to accept the amendment.

Mr. Abel Smith said it was not clear what the local authority really was.

Mr Tennant said it was the local authority, whoever that authority might be, and not the county authority. In a rural district it would be the rural district council, and in an urban district the urban district council.

Mr. Abel Smith: But what about the case of a county borough?

Mr. Tennant replied that it was not the county council.

Mr. Henderson said he did not like the amendment at all. It might very well happen that a small country authority might put great difficulties in the way of a company coming into its area for the supply of electricity, and might be able to stop the public from getting a supply where it was very much wanted. He thought the power should remain with the Board of Trade, as at present.

Mr. Tennant said the answer to that objection was that it was not an absolute consent—only a provisional consent. Sometimes the local authority said that they did not get all they wanted, and sometimes it was the undertakers. He wanted to hold the balance fairly between the two. He was informed that the county authority was created under the Act of 1889, so that he did not think there was any ground for fear that their power would be over-ridden by the urban or rural district authority.

*(To be continued.)*

**Third Readings.**—In the House of Lords on July 19th the Torquay and Paignton Tramways Bill, Folkestone, Sandgate and Hythe Tramways Bill, and the Oxford and District Tramways Bill were read a third time and passed. On July 15th, the North East London Railway Bill passed its third reading.

**Long-Firm Frauds.**—At Bolton Quarter Sessions, on July 15th, Thos. Brock Conway, *alias* Geo. Wilson, and Robert Bullock, *alias* Johnson, were indicted for conspiring to obtain goods by false pretences, including two motors from the Rhodes Motor Co., of Manchester. The accused traded at 11, Church Wharf, Bolton, under the style of Wilson & Co., and were arrested at Sheffield, where they were carrying on business under the name of G. R. Holmes. Bullock was sentenced to 12 months' hard labour, and Conway to nine months.

# LEGAL.

Hall *v.* Marconi's Wireless Telegraph Co.

This case, which came before Mr. Justice Ridley in the King's Bench Division last week, was an action by Mr. H. C. Hall against the defendants for damages for breach of contract. The plaintiff's case was that by an agreement dated April 8th, 1908, when he was retiring from the directorship of the defendant company, the company agreed for certain considerations to allot and issue to him before May 7th, 1908, 10,000 fully-paid shares of £1 each in the company, and to use their best endeavours to procure a quotation for them on the London Stock Exchange. The shares were allotted, but the plaintiff alleged that the defendants, in order to prevent the shares from being sold pending an issue of 250,000 preference shares which they were bringing out, took no steps to get the special settlement till about May 30th. In the result plaintiff's shares were eventually sold for a price lower than he would have otherwise obtained, and plaintiff alleged that the loss he had suffered was about £2,583. At the conclusion of the arguments of counsel, his Lordship held that on the construction of the agreement the plaintiff had no case, and entered judgment for the defendants, with costs. His Lordship said he was of opinion that the plaintiff had suffered no damage, as the shares were at the present time at a higher price than they were in May and June.

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The Uxbridge and District Electric Supply Co., Ltd.

In the Companies' Winding-Up Court on Tuesday, Mr. Justice Neville heard a motion by the Metropolitan Electric Supply Co., Ltd., on behalf of themselves and all other debenture-holders for the appointment of a Receiver of the Uxbridge and District Electric Supply Co., Ltd.

Mr. Bramwell Davis, K.C., in support of the motion, said that some time ago a petition was presented for winding up the defendant company, and that petition had been granted. A liquidator was appointed who was carrying on the business, but it was felt that the company could only be successfully carried on if fresh capital was forthcoming. Fresh capital could only be raised by a receiver in the debenture-holders' action. The debenture-holders' security had crystallised and a receiver had been appointed, but owing to the liquidation it was necessary before he could do anything that he should be appointed a Receiver of the Court. Counsel understood that the point would be taken that this being a statutory undertaking, no Receiver could be appointed. There was, however, authority against that proposition, though, no doubt, with regard to a company having statutory obligations creditors could not obtain a manager.

Mr. Peterson, K.C., for the liquidator, said he did not propose to take that point. His case was that a receiver was unnecessary.

His Lordship said it seemed to him that the only effect of appointing a receiver would be to prevent the liquidator carrying on the business.

Mr. Bramwell Davis said they had no wish to do that, and he did not think the appointment would have that effect. The receiver would only get the net rents.

His Lordship: Then it seems to me the appointment of a receiver is useless.

Mr. Bramwell submitted that it was necessary, in order that the capital required could be raised.

Mr. Peterson did not think that was so, but he was willing that the Official Receiver who was now acting as liquidator should be appointed receiver.

Mr. Bramwell said that would satisfy him, and his Lordship accordingly appointed the Official Receiver to be receiver in the debenture-holders' action until further order.

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Consolidated Nickel, Tin and Copper Mines, Ltd., *v.* Crompton & Co., Ltd.

Mr. Muir Mackenzie, the Official Receiver, on Friday last delivered his considered judgment in this case, the facts of which and the evidence have been reported in the Electrical Review.

The Official Referee, in delivering judgment, said the action was brought by the plaintiffs against the defendants for damages for breach of contract to supply electrical pumping plant in accordance with the terms of a specification which was accepted. The licence which was granted for working the Wheal Busy mine contained a provision that the licensees were to erect on the site of the mine a pump capable of pumping 1,000 gallons of water per minute at a depth of 120 ft. Plaintiffs' case was that the defendants agreed to supply such a pump, and failed to do so within the time agreed or at all. Plaintiffs informed the defendants of their requirements; that, in his opinion, was clear from the letters which passed from the defendants to Messrs. Worthington in 1907. The specification was for plant capable of delivering 1,000 gallons a minute against a total head of 120 ft. including friction. Plaintiffs had the right to expect, and to believe, that their contractors were offering to them a plant capable of performing that work, and he (the Referee) finally decided that that was the contract. Defendants undertook to supply plant consisting particularly of a gas engine, alternator, producer and pump; under the terms of the contract it was to be delivered, erected, and set up not

later than May 24th, 1907, and there was to be a forfeit by the defendants of a penalty of 1 per cent. of the contract price (which was £1,640) per week for the first three weeks after the date for completion, and 10 per cent. of the contract price per week afterwards for each week after the date for completion stated in the contract had passed, and it was also stated in the contract that this forfeit was not to be enforced if the delay was due to causes outside the defendants' control. There was delay, and the point he had then to consider was whether that forfeit he had mentioned was a penalty or liquidated damages. In his opinion it was clearly liquidated damages. The result of delay in delivery as regarded loss and damage being uncertain, plaintiffs had pre-estimated what the amount of the damage was to be. There were expressions in letters in April, 1907, which showed that the defendants were aware that the penalty of delay would be very heavy. Defendants purchased the pump from Messrs. Worthington, a firm of great eminence, but they would not bind themselves to any particular date of delivery. Messrs. Worthington did not make the pump themselves in England, but employed a German firm of manufacturers to make it, and, according to the practice in Germany, part of the work was sub-contracted by the German manufacturers to another firm. Defendants said that the delay which had occurred was due to causes beyond their control. In his (the Referee's) opinion, that was clearly not so, and he therefore found that the delay was not due to causes beyond the control of the defendants.

The learned Official Referee having referred to the evidence on the question of delay, said he had upon his findings of fact to consider what the damages recoverable by the plaintiffs were. He considered that, with regard to delay up to October 19th, the plaintiffs were entitled to damages in respect of the diminution in value between the installation which they contracted for and the installation which they got. That diminution in value must be, from the evidence that he had received, more or less a matter of conjecture, but he assessed it at £100. He assessed the liquidated damages for delay at £2,200 and a further sum of £500 for damages after the plant was set up. Deducting these sums from certain items in the defendants' counterclaim, which the plaintiffs admitted, there would be judgment for the plaintiffs for £1,738 19s., with the costs of the action.

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### The British Aluminium Co., Ltd.

In the Chancery Division on Saturday, July 17th, Mr. Kirby, on behalf of the plaintiffs, formally applied to Mr. Justice Warrington for judgment in the debenture-holders' action, Morrison and others *v.* the British Aluminium Co., Ltd. Counsel asked that the usual accounts and inquiries should be ordered, and also that the trust should be executed by the Court.

His Lordship gave the usual judgment in a debenture-holders' action, including the order asked.

Two petitions, the first presented by Dick, Kerr & Co., Ltd., of London, and the second by A. Schonfield & Co., of Glasgow, for the winding up of the British Aluminium Co., Ltd., were before Mr. Justice Neville in the Winding-Up Court on Tuesday last.

Mr. Martell, K.C., who represented the first petitioners, said that they were creditors for goods sold and work done to the amount of over £1,000. The Aluminium Co. was incorporated in 1894, and its present capital was £1,300,000. The company had issued two series of debentures; of the first series there was £123,900 outstanding and of the second £875,600 outstanding. In June last the debenture-holders commenced an action to enforce their security, and on June 29th a Receiver was appointed. As regards the company the case was simple. The petitioner's debt was undisputed, the company could not pay, and therefore the petitioner was entitled to a winding-up order. An affidavit had, however, been filed on behalf of the company, in which it was stated that the assets were largely in excess of the debenture debt. The company's business was improving, and a scheme for reconstruction, which he supposed would provide for the payment of the unsecured creditors in full, was in course of preparation. The Receiver had made an affidavit, in which he stated that owing to his recent appointment he had not yet had time to go into the company's affairs. The petition was opposed by a large number of debenture-holders, shareholders, and creditors. Under those circumstances the petitioners, who, of course, were only desirous of obtaining payment, had no objection to the matter being adjourned in order to see if something could not be done, and he was willing that his petition should stand over until the second petition day in next sittings, if the second petition also stood over.

Mr. Stewart Smith, K.C., for the second petitioners, said they were unsecured creditors on dishonoured bills of exchange, and they had no objection to the proposed adjournment.

Other counsel for creditors and debenture-holders supported an adjournment.

Mr. Younger, K.C., for the company, said he could not deny the petitioner's right to an order, but it seemed for the benefit of everyone that some arrangement should be come to. The company had put in evidence certain facts which showed every indication of its having a prosperous career, and a winding up was opposed by the preponderance of creditors. The assets of the company were very large—over £2,241,000—but their work was in a more or less experimental stage. They had, however, turned the corner, and they were now earning sufficient to pay the interest on the debentures. Their business was that of making aluminium by an electrolytic process in which water-power was largely used, and they had now large works on Loch Leven and elsewhere in Scotland. It was thought that the company would be a very great success, but at present, owing to the works taking longer to complete than was originally anticipated, they found themselves in an embarrassed position.

Mr. Hamilton, K.C., for unsecured creditors to the amount of £123,000 odd, also supported an adjournment, and, there being no opposition, his Lordship allowed both petitions to stand over until the second petition day in next sittings.

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### W. R. Sykes Interlocking Signal Co., Ltd., *v.* McKenzie and Holland, Ltd.

In the Chancery Division, on Thursday last week, Mr. Justice Parker heard this action by which the plaintiffs sought an injunction to restrain the defendants, a Worcester company of signal and railway engineers, from representing that they were licensees of the Sykes patent block and electric interlocking signal patents, or that they were in any way connected with the plaintiff company.

Mr. Gore Browne, K.C., and Mr. Shaw appeared for the plaintiffs, and Mr. Mark Romer, K.C., and Mr. Ashworth James for the defendants.

In opening the case, Mr. Gore Browne said that the plaintiffs were the owners of a system of block and electric signalling, certain patents in respect of which had ceased to exist. At one time the defendants were licensees of the Sykes patents, and were the principal agents for the Sykes system of block and electric interlocking signals. Their rights as to England, however, expired in 1903, and their rights in the Colonies in 1905. In September of 1907 the plaintiffs noticed an advertisement in the *Railway Times* to the effect that the defendants were the sole licensees of the system, and they thereupon wrote to the defendants, who promised that the advertisement should be withdrawn. Consequently, no further action was taken in the matter at the time. In 1908, from communications the plaintiffs had from the Agent-General of New Zealand, they were led to believe that the defendants were still representing themselves as the agents of the Sykes system, and in August of that year they again communicated with them. The defendants replied that through inadvertence the statement complained of had not been removed from the letter paper in New Zealand, but they were cabling out instructions to set the matter right; as, however, they said the Sykes system was no longer in existence, they denied any liability. The matter again dropped, but in November, 1908, the plaintiffs found that the advertisement originally complained of was appearing in the Railway Official Gazette, that advertisement containing the statement that McKenzie & Holland, Ltd., of Worcester, were the sole licensees of Sykes block and electric interlocking signals. Having had the defendants' assurance that the offending statement would be withdrawn in 1907, and finding the advertisement was being continued in 1908, the plaintiffs issued the writ in the present action in December, 1908. They asked for an injunction to restrain the defendants from representing themselves as the sole licensees or licensees of the Sykes patent block and electric signal system, or that they were otherwise connected in business with the plaintiff company.

Mr. Romer said that he admitted that the defendants were not entitled to represent themselves as the licensees of the Sykes patents, though he did not admit that the plaintiffs were entitled to restrain them from using the word "Sykes." Under those circumstances he was willing to submit to an order in a limited form, and to pay the costs of the action.

Mr. Gore Browne said the plaintiffs were willing to take an order in the terms offered.

Mr. Romer desired to say that the reason the defendants offered to pay the costs, was that they felt it was through their carelessness that the advertisement was not withdrawn, and under the circumstances, the plaintiffs were justified in bringing their action.

His Lordship made an order in the modified terms agreed upon

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### Workmen's Compensation.

On Tuesday, in the Marylebone County Court, before Judge Bray Joseph Coffey, labourer, of 16, Ethelred Street, Kennington, applied for an award under the Workmen's Compensation Act, the respondents being the Westminster Electric Supply Corporation. Coffey, it appeared, was engaged, with other labourers, cutting a trench, on December 9th, 1908, in Bryanston Place, W., when he fell into a hole, a depth of some 12 ft., and severely injured his face, arms, legs, shoulder and ribs, which totally incapacitated him from work for a long period. His average earnings were 29s. a week, and half of this amount he now claimed.

His Honour awarded the applicant £18 15s., with costs on the higher scale, these not to exceed £15.

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**Walking Contest.**—The employés respectively of the Birkenhead and the Wallasey municipal tramway and electricity departments held their annual walking contest on Saturday last over a course of about nine miles, from the Tramwaymen's Club, Argyle Street, Birkenhead, to the headquarters of the Wallasey tramwaymen in Seaview Road, Liscard. The Wallasey competitors proved the winners.

# BUSINESS NOTES.

**Restoration of Patent Refused.**—The Comptroller-General of Patents has dismissed the application of André Blondel for the restoration of patent No. 15,527, of 1902, for "Improvements in or relating to wireless telephony."

**Fire Extinction.**—MESSRS. LUND BROS. & Co., of 78 and 80, Queen Victoria Street, E.C., the well-known electrical contractors, have sent us particulars of their "Ready" patent system for fire extinction, which is intended for "first aid." Essentially it consists of 40-gallon steel vessels full of water, situated at various points in a building, and provided with hosing and nozzles; these are connected by small copper pipes to a reservoir of compressed air, which is charged by hand, but there is a valve at each water vessel which prevents the pressure being applied to the water until an emergency arises. On opening this valve a 60-ft. jet is produced, lasting for 6½ minutes. Air leakage is prevented by the mode of construction, and an alarm can easily be attached, which rings when the pressure is reduced by bringing the apparatus into operation at any point.

**Book Notices.** — "Metric Tables." By Sir G. L. Molesworth. London: E. & F. N Spon, Ltd. 1909. Price 2s. net.

"Making Wireless Outfits." By N. Harrison. London: E. and F. N. Spon, Ltd. 1909. Price 1s. 6d. net.

"Circuits and Diagrams." Part II. By N. H. Schneider. London: E. & F. N. Spon, Ltd. 1909. Price 1s. 6d. net.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXVIII, No. 7. July, 1909, containing the papers read at the Annual Convention, June 28th—July 1st. New York: The Institute. Price $1.

"The Gas, Petrol and Oil Engine." By D. Clerk. Vol. I. London: Longmans, Green & Co. 1909. Price 12s. 6d. net.

"*Journal* of the Western Society of Engineers." Vol. XIV, No. 3. June, 1909. Chicago: The Society. Price 50 c.

"*Transactions* of the North-East Coast Institution of Engineers and Shipbuilders." Vol. XXV. Parts 7 and 8. July, 1909. London: Andrew Reid & Co.

"The Physical Review." Vol. XXVIII, No. 6. June, 1909. London: Macmillan & Co.

**Exhibitions.**—*Ironmongery and Hardware Trades' Exhibition.*—This Exhibition at the Royal Agricultural Hall, Islington, closes to-day (Friday). There are a few exhibits of electrical and allied interest. Messrs. C. Toope & Son, of Stepney Square, High Street, Stepney, E., have among other manufactures on view, their non-conducting coverings for steam pipes and other hot surfaces, including corrugated asbestos pipe covering, wire space asbestos covering, asbestos coverings for flanges, &c., such as they have supplied for several electricity works, including Wood Lane generating station, and the Stepney electricity works; Messrs. Fredk. Braby & Co., Ltd., of Euston Road, show copper, steel, and aluminium manufactures, and aluminium galvanising paint; Messrs. Palmer & Co., of 35, Vittoria Street, Birmingham, as well as a variety of polishing and plating materials, exhibit their plating dynamos as used in some of the largest works in this country, and their patent "Silverite" nickel anode which is cast in one furnace within another, it being taken out of the inner furnace and poured while in the larger one, the effect being that it wears to a knife edge instead of crumbling to pieces. The Albany Engineering Co., Ltd., of Ossory Road, Old Kent Road, S.E., have a good collection of electric fans of all types, such as they make up to 6 ft. diameter. It is claimed that, owing to the shape of the propeller blades, the air is thrown off the centre, no draft being made at the ends of the fans. The firm's rotary pumps, electrically driven, such as are supplied to the Admiralty and others, are also in evidence. On the same stand, Mr. Wintour H. Phelps, of Teddington, S.W., shows for the first time his electric motor-driven "Nuklena" vacuum cleaner. An interesting exhibit is that of Smoke Consumption Ltd., of 82, Victoria Street, S.W., who show Cowper-Cole's patent "Caloriser" for applying in the furnaces of Lancashire and other boilers, and give a demonstration by means of a small model furnace, &c., of the smoke consuming capabilities of the appliance. A certain length of the flue behind the bridge is lined with bricks made of a material which becomes incandescent more readily and at a lower temperature than ordinary fireclay. At the end of this space a combustion wall is built right across the flue, having a large square aperture serving as a manhole, and built up of a number of specially-formed "Caloriser" tiles. As the gases evolved from the flue pass over a narrow opening above the bridge, they expand into the large and highly heated space between the bridge and the combustion wall, and become well mixed, owing to the retardation of their velocity before passing finally between the incandescent tiles which form the combustion wall. A large and effective exhibit of gas and electric lighting and bell and other electrical manufactures is shown by Messrs. Falk, Stadelmann and Co., Ltd., of Farringdon Road, E.C.; the "Eferca" metallic-filament lamps making a brilliant display. The Harquin Pendant Co., of 136, Kentish Town Road, N.W., have on show their patent electric pendant and cord-absorbing and other fittings. Messrs. W. Canning & Co., of Great Hampton Street, Birmingham, have a large and well-arranged stand which catches the eye immediately one enters the Hall, where their electro-plating and polishing machines, plating dynamos, motor-generators, electric motor polishers, and other manufactures may be seen.

*The White City Exhibition.*—We went to visit this Exhibition at Shepherd's Bush the other day, in complete ignorance as to the extent and character of the engineering and electrical exhibits, excepting that we knew that the Simplex Conduits "Electric Home" display was well worth seeing. Our impressions of this we have already published. As to the other exhibits, well—they require only brief mention, for compared to last year, they occupy very little space indeed. By far the largest is that of the Cowper-Coles Engineering Co., Ltd. It is an instructive exhibit of their electro-deposition and electro-galvanising processes, and other plant, and we may allude further to it in a later issue. Messrs. Babcock & Wilcox, Ltd., have a model of their boiler surrounded by a wilderness of open space, which might have been occupied by other stands if, we suppose, exhibitors could have been obtained. Not far away there is a joint exhibit by several contracting firms, showing a section of the Central London Railway tube with a coach standing therein. The Norwegian Nitrate Works, Ltd., of Christiania, are present to draw attention to their manufacture of atmospheric nitrogen by electricity. The Western Electric Co.'s stand consists of a large neat show-case containing specimens of their telephone cables and instruments, and other manufactures. Electric lighting fittings are exhibited by Messrs. Tredegar & Co., and electro-medical apparatus (Holmquist) is displayed by the Regent Electric Co., Ltd. In addition to the foregoing, some other stands were still erecting at the time of our visit—perhaps they will be electrical, perhaps not, and may be they are intended for next year's Japanese Exhibition.

**Trade Announcements.**—THE BRITISH INSULATED AND HELSBY CABLES, LTD, of Montreal, have sold their interests in Canada to the CANADIAN BRITISH INSULATED CO., LTD., Montreal.

MESSRS. F. C. EDEY & CO., electrical contractors, have removed from Ludgate Hill, where they have been for the last 16 years, to larger premises situated at 25, Warwick Lane, E.C. Their telephone number is unaltered—viz., "2,547 Central."

THE MIDLAND ELECTRIC MANUFACTURING CO., LTD., of Birmingham, have appointed MESSRS. DOWNES & DAVIES, 67, Stanley Street, Liverpool, as their sole agents for Lancashire and Cheshire.

MR. H. G. NICHOLLS, who has for several years been assistant general manager of the Canadian General Electric Co. and the Canada Foundry Co., has resigned that position in order to go into business for himself. He has organised a company called Factory Products, Ltd., with offices in the Confederation Life Building, Toronto, for the purpose of acting as Canadian selling agents for representative manufacturers.

MR. H. T. BOOTHROYD announces that, in consequence of his partnership with Mr. A. M. Hyslop having been dissolved by mutual consent, the business of H. T. Boothroyd, Hyslop & Co. has been converted into a private limited liability company under the title H. T. Boothroyd, Ltd. The management will be under his personal control as sole proprietor and governing director.

**To Advertisers.**—We occasionally receive advice from visitors who call upon us here, hailing from secluded quarters of the Colonies and other parts, showing that the facilities for gaining information regarding what is going on a few hundred miles away from them are very poor. Indeed, they frequently find in our own pages matter of interest to them relating to doings of their Colonial brethren which has not reached them until we have first published it here. If this applies to editorial matter and among purely electrical men, it also certainly equally applies to advertisements, which aim to reach the men of other industries who cannot be expected to know electrical addresses. The Colonial and foreign reader in a large land such as, for example, Australia, may be in absolute ignorance of the addresses of representatives of British firms who have branches more or less in his vicinity. The point has been mentioned before, and we notice with interest that one of His Majesty's Trade Commissioners for Australia has sent home a suggestion to British manufacturers to which they should give heed in preparing their advertisements for the ELECTRICAL REVIEW. He says that where British firms advertise in trade newspapers which circulate out there, it would be of interest to prospective customers if, in preparing their advertisement, care were taken to give the name of the Australian agent, if such there be, together with the telegraphic address and name of code-book adopted. We leave the suggestion with the electrical trade. It is a small thing, but it may mean all the difference in the world between getting or losing a contract, possibly allowing it to go to some more pushful firm in another country instead of coming to the old country.

**Annual Outings.**—THE BRYANT TRADING SYNDICATE, LTD., held the annual outing of their "Metalite" lamp works staff on Saturday last—at the cost of the directors—when about 200 of the girls spent a thoroughly enjoyable day at Brighton. Sports were held during the morning, and some novel and appropriate competitions were introduced, such as the Metalite lamp and spoon race, filament counting race and "potato" race with Metalite lamps instead of potatoes. After dinner, which was partaken of at the Royal Hotel, the managing director, Mr. Joseph Metcalfe, thanked the staff for their loyal service. The prizes were then distributed by Mrs. Metcalfe, who in turn was presented with a beautiful bouquet by the staff.

The staff of the GUILDFORD ELECTRICITY SUPPLY CO., LTD., held their fourth annual outing on Wednesday, 7th inst., when they journeyed to Bournemouth. The party left Guildford soon after 6 o'clock in the morning, and immediately on arrival at Bournemouth partook of breakfast at the Wilberforce Hotel. Dinner was served at the London Hotel, and in the afternoon an enjoyable trip was made to Swanage, where tea was served.

On Saturday, July 17th, the employés of the electric traction maintenance department of the METROPOLITAN RAILWAY WORKS, Neasden, went for their first annual outing to Southsea. The party

assembled at the Wiltshire Lamb Hotel, where dinner was served, after which various toasts were proposed, and Mr. Onions in his speech remarked that the party was largely indebted to the generosity of the numerous subscribers. A short musical programme, provided by several of the members, followed.

On Saturday last the annual outing of the staff of Mr. W. D. Willson, electrician, of High Street, Croydon, was held, a journey being made to Stafford Woods, near Eden Bridge, by brake, where lunch and tea were served. The company were favoured with splendid weather. An afternoon cricket match and evening sports were, among the day's features, productive of much pleasure. On the journey home the brake was illuminated by Osram lamps.

On Saturday last the employés of Messrs. Rawlings Bros., Ltd., of Kensington and Belgravia, held their annual outing, Pangbourne, the spot selected on this occasion, being reached before 9 a.m. The party was 100 strong. A cricket match between the Visitors and Office Staff *v.* the Works Staff, in which the latter were victorious, together with sports, filled the morning's programme, and at noon the party repaired to Ye Olde George Hotel. The weather being fine, there was no desire to prolong the speech-making after dinner longer than was necessary. Mr. T. S. Rowden proposed the toast of the employés, which was responded to by Mr. F. B. Howard. The chairman, Mr. W. R. Rawlings, in responding to the toast of "The Firm," proposed by Mr. A. Hanham, remarked that owing to the unprecedented pressure of work in the motor department, practically the whole of that branch had had to remain at work, and were unable to be with them. He was glad to be able to report that steady progress was being maintained by the firm, and he could not too often remind them that the interests of the firm and of the employés were identical. Mr. A. Sharp then proposed the toast of "The Chairman and Managing Directors," which was briefly responded to by the chairman. Later, the launch *His Majesty* was boarded, and a most pleasant afternoon was spent admiring the delightful scenery and passing the time with musical and other items. Returning to Pangbourne, tea was served.

**Bankruptcy Proceedings.** — Arnold Roberts (Roberts Brothers), electrical engineer, Bradford.—A first dividend of 2s. in the £ is payable July 31st at the offices of J. H. Haley, 29, Tyrrel Street, Bradford.

**Private Meeting.**—W. J. Woodward (trading as the Vulcan Electric Co.), manufacturing electrician, 43, The Broadway, Stratford.—A meeting of the creditors was held on July 15th, when a statement of accounts as at July 9th last was presented. This showed liabilities amounting to £872, of which £308 was due to trade creditors and £521 to cash creditors, the balance of £42 representing claims by workmen. There were preference claims for £46, and after providing for these the assets were expected to produce £85, or a deficiency of £787. It was pointed out that the assets had been written down by no less than 50 per cent. Apparently the whole of the deficiency had arisen during the last 12 months. A balance-sheet was prepared at the end of December, 1908, and this showed that there was little, if anything, wrong with the concern. For the six months ending June 30th of the present year there had been a net loss on the trading of £369. The debtor had no offer to make, and stated that he could not see his way to continue the business. The matter was discussed at some length, and eventually it was decided that the estate should be realised under a deed of assignment. Mr. G. Corfield, of Messrs. Corfield & Cripwell, accountants, Finsbury Pavement, E.C., was appointed to act as trustee in the matter.

**First Meeting.** — William Thomas Harris (trading as W. T. Harris & Sons), electrical engineer, 460 and 464, Commercial Road, and 47, Emanuel Street, Portsmouth.—The first meeting of the creditors in this case was held on Monday last at the Official Receiver's Offices, Cambridge Junction, High Street, Portsmouth. The Official Receiver stated that there was a reasonable prospect of the creditors receiving 20s. in the £, and there was a proposal to leave the debtor some part of the business. It seemed as though he had had more than he could manage, but he believed the part of the business that it was desired to leave him could be managed by him to his profit. It was a matter for the trustee and the Committee. It was ultimately decided that Mr. E. W. C. Whittaker, of Southampton, should be the trustee, a Committee of Inspection being also appointed, consisting of Messrs. Johns, Grace and Hutchings. The following are creditors:—

| | |
|---|---|
| Armorduct Manufacturing Co., Ltd., London | £16 |
| Braulik, G., London | 18 |
| Bates, W. A., Ltd., Leicester | 24 |
| Canning, W., & Co. | 32 |
| Grace, Mrs., Ryde | 50 |
| Hutchings, C., & Son, Portsmouth | 11 |
| Johns, Southampton | 100 |
| "Bankers," Portsmouth | 297 |
| Ryder, Portsmouth | 40 |
| Vacuum Oil Co., Ltd., London | 14 |
| Woodgate Bros., Tiverton | 19 |
| Palmer Tyre Co., Ltd., London | 10 |
| Fully secured creditors | 3,150 |
| Preferential creditors for proportion of apprenticeship premiums | 55 |

**Annual Holidays.**—The Adams Manufacturing Co., Ltd., of Bedford, announce that their works and offices will be closed from Saturday, July 31st, till Monday, August 9th, though a small staff will be retained to attend to matters of urgency.

The Electric and Ordnance Accessories Co., Ltd., of Aston, advise the trade that their works and offices will be closed from the night of Friday, July 30th, until Monday, August 9th, but a small staff will be in attendance to handle pressing matters.

The New Brotherton Tube Co., Ltd., of Wolverhampton, state that their works and offices will be closed for holidays and stocktaking from August 2nd to 7th.

**Dissolutions and Liquidations.**—The Auto-Claw Co.—The examination of the directors in this matter will be held before the Registrar at the Companies Winding-Up Department, Bankruptcy Buildings, Carey Street, on Tuesday, 27th inst., at 2.30.

Electric Taxicab Co., Ltd.—A meeting is to be held at 7, Hertford Street, Mayfair, W., on August 19th, to hear an account of the winding-up from the liquidator, Mr. W. Milne.

The London Electrobus Co., Ltd.—A petition for the winding-up of this company has been presented by Messrs. Pritchetts and Gold, Ltd., creditors, and is to be heard on July 27th.

Uxbridge and District Electric Supply Co., Ltd.—First meetings of creditors and contributories are to be held at Carey Street, W.C., on July 29th.

The Electrical Works and Development Co., Ltd.—Creditors must send particulars of their debts, &c., to the liquidator, Mr. R. A. Boughton, 52, Gracechurch Street, E.C., by August 31st.

Hobart & Ellis and H. M. Hobart, consulting engineers, Oswaldestre House, Norfolk Street, W.C.—Messrs. H. M. Hobart and A. G. Ellis have dissolved partnership. The address of Mr. Ellis, who retires, is now Güterstrasse 274, Basle, Switzerland.

Mountain & Gibson, Ltd.—The petition for the winding-up of this company, which came before the Court of Chancery of the County Palatine of Lancaster on July 8th, was adjourned until July 26th, when, in consequence of the shareholders having on June 30th resolved upon voluntary liquidation, the Court will be asked to continue this voluntary liquidation under the supervision of the Court, instead of making an order for the winding-up by the Court.

Santoni Arc Lamp and Engineering Co., Ltd.—Creditors must send the usual particulars to the liquidator, Mr. W. M. Whyte, 11, Queen Victoria Street, E.C., or to Mr. G. E. Corfield, Balfour House, Finsbury Pavement, E.C., the liquidators, by August 20th.

**British Medical Association's Exhibition, Belfast.**—Messrs. Siemens Bros. & Co., Ltd., of Caxton House, Westminster, S.W., inform us that they are showing some interesting novelties and improvements in electro-medical and other appliances at the above Exhibition. The most recent advances in X-Ray work have been instantaneous radiography and the production of unidirectional high-tension current without the aid of induction coils and interrupters; both these functions are fulfilled by the new Siemens X-Ray outfit with rotary high-tension rectifier. The outfit comprises a special transformer with sub-divided primary, which is connected direct to an A.C. supply; the alternating current is stepped up to the pressure necessary for the tube, and is then commuted by means of a rectifier, which is rotated by a self-starting synchronous A.C. motor, also connected direct to the mains. Where only a D.C. supply is available, a rotary converter is connected to the mains; this generates alternating current and also rotates the rectifier. The chief advantages of this system are that inverse radiation is entirely eliminated, and the plant provides a large reserve of energy suitable for instantaneous radiography.

Messrs. Siemens are also showing one of their new "G.P." X-Ray outfits, which has been designed to bring the price of such apparatus within the means of the general practitioner, whilst the workmanship and material are very high class. The outfit consists of a 16-in. spark induction coil, spark-gauge, switch-table and Wehnelt interrupter. All the apparatus is mounted on a protective screen lined with lead, and provided with a lead-glass window. Another exhibit in this connection is their so-called Universal and safety protective tube stand, a general utility apparatus for holding the patient securely in the standing or sitting position, and protecting him and the radiographer from the harmful effects of the X-rays, while permitting the free movement of the fluorescent screen or dark slide in any direction in relation to the patient.

Another electrical novelty exhibited by Messrs. Siemens Bros. is their clinical temperature recorder. This consists of a platinum spiral in a quartz tube, known as the "resistance thermometer," which is inserted into a suitable part of the human body; a 4-volt accumulator battery; a regulating apparatus; and a recording milli-voltmeter of the well-known Siemens type, as used for thermo-electrical measurements, &c. The instrument is supplied in two patterns, with suspended or pivoted moving coil, and both patterns can be provided with a slow or quick recording device. With this apparatus, investigations can be made over periods of several days, and continuous curves obtained in order to demonstrate the progress of pathological cases and the effects of the adminstration of drugs, &c.

Messrs. Siemens Bros. & Co. also exhibit radium, radio-active substances with applicators for treatment, and radio-active earth, for local application, &c.

**New Tantalum Lamp.**—Messrs. Drake & Gorham, Ltd., announce that they are putting on the market a new type of high-voltage tantalum lamp suitable for direct current, 200 to 230 volts, to give 25 C.P. at an efficiency of 1·7 watts per candle. It is supplied in either bell or spherical shape.

**Catalogues and Lists.**—British Thomson-Houston Co., Ltd., Rugby.—Leaflet No. 2,117, giving an interesting partial list of Curtis steam turbines which have either been installed or are in course of construction.

Stolzenberg Patent File Co., 50/53, Bishopsgate Street Without, E.C.—Illustrated leaflet of Stolzenberg roll-top desks, with interchangeable fitments for same.

Vortex Pulley and Belting Co., Tower Royal, E.C.—Reduced price list of "B B" wood-split pulleys.

C. Herrm. Findeisen Maschinen Fabrik, Chemnitz-Gablenz. —Illustrated price list, with letterpress in English and three other

languages, relating to electric passenger and goods lifts, travelling cranes, &c.

MESSRS. J. H. HEATHMAN & Co., Parson's Green, Fulham, S.W.—New price lists in the firm's well-known style of steps, ladders, tower ladders and other specialities of the same class, for which Mr. Heathman is so well-known.

PREMIER ELECTRIC HEATERS, LTD., Ashley Street, Birmingham.—Two new lists have been issued relating to the Premier flat-irons, kettles, &c. They contain particulars and prices of a number of appliances introduced since the firm's first list was issued. The variety of irons ranges from 3 lb. to 24 lb. in weight, and the other manufactures include a selection of kettles, hot water jugs, hot plates, shaving pots, &c., including some cheap pattern kettles. The heating element is the "Premier" improved strip with simplified means of fixing, which is shown in the lists. We understand that the apparatus is in all cases guaranteed for 12 months.

THE LONDON ADVERTISING LETTER CO., 10, Charles Street, Hatton Garden, E.C.—Twelve-page pamphlet, giving particulars and prices of "Serchlite" electric signs and electric letters for outside and inside illumination.

MESSRS. A. E. LUC. COURT & CIE, 88-92, Rue Robert, Lyon.—Illustrated price list in French of the "Erga" electric lifting tackle.

MESSRS. ARTHUR JOPLING & Co., 10, Westmorland Buildings, Aldersgate Street, E.C.—List containing a description of Jopling's Sunny flame and Economic enclosed arc lamps, also a 44-page catalogue showing and giving prices of a great variety of electrical devices, such as lampholders, switches, cut-outs, ball fittings, watertight fittings, flexible wires, bell indicators and accessories, batteries, fans, shades and so on.

SUN ELECTRICAL CO., LTD., Charing Cross Road, W.C.—New catalogue Section L (12 pages) showing and stating prices of a variety of novel and useful designs of glass shades for electrical fittings, including pines for metal filament lamps, silvered glass reflectors, &c.

BRITISH ELECTRICAL AND MANUFACTURING CO., I, St. Nicholas Buildings, Newcastle-on-Tyne.—Catalogue No. 424 (40 pages) dealing fully in a number of sections with their iron-armoured insulating conduit and fittings, Greenfield flexible steel-armoured conductors and flexible cord fittings for the latter, Greenfield flexible steel conduit, single and double strip types, cast-iron outlet and junction boxes and covers, knock-out boxes, and a great variety of other fittings; also a companion pamphlet giving a list of buildings which are wired on the Greenfield system. The company are acting agents in the United Kingdom for the manufacturers of this system, which has been in use in the United States for many years, and on some important installations in this country.

INDIA-RUBBER, GUTTA-PERCHA AND TELEGRAPH WORKS CO., LTD., Silvertown, E.—Twenty-page illustrated catalogue and price list of mechanical rubber goods, including rubber sheeting, trolley wheel covering, steam and suction hose, machine belting, corrugated matting, rubber gloves, &c. Copies of the list may be obtained on application by those specially interested.

The A.E.G. ELECTRICAL CO. OF SOUTH AFRICA, LTD., Caxton House, Westminster.—Batch of lists relating to various manufactures, as follows:—Slow-speed three-phase motors; large three-phase induction motors (outputs 100 to 1,000 H.P.); three, two and single-phase induction motors (7·5 to 100 H.P.); small continuous-current motors and generators (outputs up to 7 H.P. and 5·75 KW.); iron switch cases for pressures up to 7,500 volts; electric annealing and tempering plants; lift controlling gear. All the lists are very complete with tabular information as to weights, prices, &c.

**Australia.**—The Australian Customs authorities have recently given a decision to the effect that "resistance coils with arc lamps" are to be classified as electrical appliances under No. 177c of the Tariff, the duty being 20 per cent. *ad valorem* on both British and foreign manufactures.

**Italy.**—A new company has just been formed in Milan with a capital of £20,000 and the title La Società Elettrotechnica Commerciale Italiana. The Allgemeine Elektricitats Gesellschaft, of Berlin, is interested in the new undertaking.

## LIGHTING and POWER NOTES.

**Aylesford.**—Messrs. Foote & Milne have informed the U.D.C. that they intend applying for a prov. order for electric light.

**Beckenham.**—It has been reported to the Council that in two cases, occupiers of houses with free wiring installations have altered the installations by fixing transformers, and it has been decided to inform them that if the installations are not reinstated in their former condition within 14 days, or in the alternative the Council's new free wiring agreement is not signed, legal proceedings will be commenced.

**Bedford.**—A letter has been received from the L.G.B. refusing to extend from 10 years the period for the repayment of the loan recently raised for substituting electric lamps for gas lamps in the street lighting.

**Blairgowrie (Perthshire).**—Intimation has been received by the T.C. from Messrs. Foote & Milne, London, that they are applying for a provisional order to supply electric lighting within the burgh area.

**Chile.**—The German Consulate in Valparaiso states that the following concessions have been recently granted:—To the Société Anonyme de Métallurgie Electrotecnique du Chili, of Combarbellá, to utilise the river Combarbellá for the generation of electric energy; to Messrs. Máximo Schmidlin and Ramon del Cazo, of Santiago, to utilise the river Colina (province of Santiago) for the same purpose; and to Messrs. Luis and Osvaldo F. de Castro and Camilo Edwards of Tocopilla, to utilise the river Loa (province of Antofagasta) for the generation of electric energy to the extent of 15,000 H.P.

**Continental Notes.**—SCANDINAVIA.—A company has recently been formed with the title Nordiske Bolaget for Metallradlamper to acquire and exploit the Swedish, Norwegian, Danish, and Finnish rights in the "Z" (Zircon-Wolfram) metal filament electric lamps. The new concern is not establishing works on its own account, but has arranged with the Glodlampfabrik, of Stockholm, for the manufacture of the lamps.

The Rjukanfos Co., which was formed not long ago for the purpose of fixing nitrogen from the air, is about to harness the Rjukan Waterfalls, which are the highest in Norway, and well known on account of their beauty. The company has recently ordered electric generators of about 70,000 H.P. in all from the Allmana Svenska Elektriska Aktiebolaget, at about £55,555. Tenders were received from all the leading firms in Europe and America, and a similar contract has been given to Messrs. Brown, Boveri & Co, of Baden, Switzerland. The contract comprises the delivery of four double generators and one single generator, each with a capacity of 17,000 H.P.

The complete plant of the Rjukan-Waterfalls will have a capacity of 170,000 H.P., and the electrical power station will probably be the largest in the world.

AUSTRIA.—A company has lately been formed in Paris with the title the Kustenlandische Gesellschaft fur Hydro-elektrische Industrie to put down plant to utilise certain available water power at Otocac, Croatia, in the generation of electrical energy for lighting and power purposes.

**Burslem.**—The T.C. has declined to entertain an offer of the Collieries Electric Power Development Syndicate, Ltd., to supply electricity in bulk.

**Chippenham.**—The T.C. has signed an agreement with the electric lighting company for the establishment of electricity works on the site of the old gas works.

**Dundee.**—A serious fire broke out at the Corporation's Dudhope Crescent electricity works on Wednesday, the 14th inst.; about 4.45 p.m. smoke was observed issuing through the floor immediately above the basement, and a hurried examination revealed the fact that the distribution cables had caught fire. The staff fire brigade were immediately called out, but so alarming did the situation become that it was thought advisable to call the city fire brigade. Within a few moments of the outbreak, the flames reached as high as the roof, a matter of 40 *ft.*, scorching the wood and breaking almost every pane of glass. Meanwhile, the generating plant had been completely shut down, and within half an hour the fire brigade had the conflagration subdued. An examination showed that the insulation of some 63 cables in the basement had been completely burned away, leaving the bare copper wire, while two engines and dynamos which are at present not in use and were in the basement were also very severely damaged by fire and water. Two rotary converters and certain local substation switchgear, recently erected, were situated close to where the fire originated, but, fortunately, no serious damage was done, with the exception of a slight injury caused by the water. As nothing could be done in the way of supplying current again until the damaged cables had been repaired, this arduous task was at once undertaken, and by 9 o'clock the work was so far accomplished as to permit of a supply of current for lighting being provided. After lighting had been supplied, efforts were next directed towards providing for the tramway supply. This was successfully accomplished a little after 11 p.m., while, at the same time, light was supplied to the whole area of supply with the exception of Lochee, which is in the district furthest from the station. The amount of the damage is estimated at £1,400, and it is fully covered by insurance. The cause of the fire is still a mystery, and various theories have been put forward; it has been suggested that it was caused by the presence of an explosive gas in the cable trench, although no report was heard to account for this.

The Corporation Electricity Department is arranging for the lighting and power required at the new submarine depôt. Ten arc lamps will be fitted, and the cabling will amount to £400.

**East and West Ashford (Kent).**—Mr. Mark Parker, of Dover, intends applying for prov. orders for electricity supply in the areas of the Councils.

**Finchley.**—At a conference convened by Finchley to consider the Electric Lighting Acts (Amendment) Bill, at which Ealing, East Ham, West Ham, Hornsey, Wimbledon, Barking, Barnes, Beckenham, Bexley, Dartford, Erith, Finchley, Ilford, Leyton, Walthamstow and Willesden, were represented, a resolution was unanimously passed welcoming the introduction of the Bill, but regretting that by the amendment made in the Bill during its passage through the House of Lords the power to provide and let for hire electrical fittings had been restricted to their provision on hire through a contractor, and expressing the hope that this restriction will be removed when the Bill is considered by the House of Commons

**Greenock.**—In connection with the negotiations proceeding between the T.C. and the Admiralty for the supply of electricity for the new torpedo factory, some delay has been caused in the signing of the agreement over a dispute on Clause 12, which bound the Admiralty to make a payment of £20 per month in the event of its not being able to take up a full supply from a specified date. The T.C. has agreed to dispense with the stipulation provided the Admiralty consents to give at least four months' notice of the date on which it will be ready to take up a supply.

**Hamilton.**—The Home Office has agreed to the request of the representatives of the Lanarkshire Miners' Federation to hold an inquiry into the circumstances of an accident in Forniegair Colliery, Hamilton, in which three miners were killed by an explosion while working an electric coal-cutting machine.

**London.**—Marylebone.—At the meeting of the B.C. on July 15th, the Electric Supply Committee reported that owing to competition with private plants it had found it necessary to arrange to give special terms to those consumers who had a maximum demand of 50 kw. and upwards, and who are prepared to enter into an agreement for at least 10 years. The basis of the agreement would be that payment at scale rate per kw. must be made in advance, the remaining charges being 1d. per unit for all units consumed. This arrangement may in the first place result in a small diminution of revenue, but it would not be considerable, and the advantage for the future very great. The scale of charges is as follows:—200 kw. and upwards, £4 10s. per kw.; 175 kw. and upwards, £4 17s. 6d.; 150 kw. and upwards, £5 5s.; 125 kw. and upwards, £5 12s. 6d.; 100 kw. and upwards, £6; 75 kw. and upwards, £6 10s.; 50 kw. and upwards, £7. One penny per unit is to be paid in each of the foregoing cases for all units consumed. The statement of accounts for the year ending March 31st last, shows that in place of the estimated deficit of £6,967, there is a debit balance of £3,930 only, and this notwithstanding £1,163 being spent in opposing Parliamentary Bills. Some 9,000,861 units were sold during the 12 months, the actual increase in sales being 369,750 units, an increase on the estimate of 70,861 units. The amount realised from sales to consumers, however, was £4,939 below the previous year's total, but this was due chiefly to reductions in price and a good proportion of new business being in respect of the lower class prices of supply. Notwithstanding the increased output, the total expenditure was £6,475 below the estimate, and £10,207 less than in the previous year. Generation expenses were ·62d. per unit sold, as against ·73d.; distribution cost ·16d., management cost ·22d., while rents, rates and sundries was ·19d. The report proceeds to point out that the maximum load last year was 7,077 kw., but the 12,000-kw. plant installed is capable of dealing with a maximum load of 10,000 kw. The additional capital required for new mains, connections, meters, &c., to deal with this increase, is estimated at £45,000 approximately. Including the last-mentioned figure, the capital expenditure (excluding the purchase or goodwill price) works out at £59·5 per kw. installed, a lower figure than in the case of any London undertaking. The report also deals at some length with the necessity, particularly in view of the heavy fixed charges, of increasing the sale of current.

Bermondsey.—The annual accounts of the electricity undertaking for the year ended March 31st last show that 2,781,583 units were sold during the 12 months, as against the estimate of 3,000,000. The actual income was £20,472, against the estimate of £21,410. The total net expenditure for the year was £18,443, which gives the cost of production at 1·59d. per unit sold. The expenditure consequent upon the Grange Road explosion was £176. The estimated quantity of units to be sold, viz., 3,000,000, was not realised, owing chiefly to consumers having reduced their consumption, due, to a large extent, as far as public buildings were concerned, to the use of metallic-filament lamps. It was expected that the Tilbury Contracting Co. would take a two years' supply; it lasted, however, only for 15 months. After paying interest and instalments on loans, the net profit on the year's working amounted to £123, which is to be carried forward to the reserve fund for principal and interest, which will then stand at £2,768. It is mentioned that during the quarter ended June 30th, 1909, the number of units sold exceeded those in the corresponding period of 1908 by 16½ per cent.

Kensington.—The Borough Council is to petition against the London Electric Supply Bill, upon the ground that the measure would deprive the Council of the right to purchase the electricity undertakings in Kensington in 1931, a right which was conferred upon the predecessors of the Council, the late vestry, by the legislature, in the session of 1888.

Bethnal Green.—The B.C. has had under consideration the question of a supply of electricity for the borough. Not having an undertaking of its own, the question was debated in committee as to taking a supply from a neighbouring borough, and on Thursday, July 16th, in open Council the Electricity Committee recommended that a supply be taken off the Shoreditch B.C. The recommendation aroused much opposition, Councillor Burton stating that the proposal would bind the Bethnal Green Council for seven years. Eventually the matter was referred back to committee.

Hampstead.—An electrical exhibition is to be held in the autumn. In connection with the street lighting, 94 incandescent gas lamps are to be converted for electric lighting; the estimated saving is put at 4s. 6d. per lamp.

**Manchester.**—Another mains explosion occurred on Monday, last week, near the Exchange. It was at first feared that results as serious as in the case of the Victoria Arcade explosion which recently occurred, might ensue, but the electricity department dealt with the matter promptly and cut the supply off. It is understood that, as in the Arcade explosion, a defective joint was the cause of the trouble.

**Nairn.**—The B. of T. has revoked the 1902 electric lighting order.

**Neston.**—The U.D.C. has given consent for Messrs. Forward & Williams, of the Hinderton Hall Estate, to lay an E.L. main so as to supply the new church and houses being erected.

**Newport (Mon.).**—Negotiations have taken place between a large firm and the borough electrical engineer, for a supply of electricity in bulk; if the customer is secured an extension of the Corporation's plant, involving an expenditure of about £70,000, will have to be made. The draft of a proposed agreement has been approved to supply energy to the Cardiff Channel Dry Docks and Pontoon Co., Ltd., up to December 31st, 1916. It is proposed to convert 150 incandescent street lamps, and 80 flat flame lamps to electricity at a cost of £460. It is estimated that the annual saving will be about £37 10s. per 100 lamps.

**Smallthorne.**—The U.D.C. has asked the North-Western Electrical Power Co., and the Hanley and Burslem T.C.'s to quote terms for public lighting at Milton.

**Southend-on-Sea.**—A loan of £18,715 for electric lighting purposes is being applied for by the T.C.

**Southampton.**—A Sub-Committee is to report upon a communication from the electrical engineer to the effect that the period for which the Council deferred the question of obtaining powers to carry on free or assisted wiring has practically expired, and urging that every effort should be made to obtain the necessary powers in order to fully develop the undertaking. The Parliamentary Committee is to consider the advisability of taking steps to reconstruct certain portions of the existing tramways at an estimated cost (exclusive of the acquirement of certain properties) of £2,680. The Parliamentary Committee is also to consider a proposal of the Tramways manager to extend the Shirley line to Anglesey Road at an estimated cost of £520.

**Thetford.**—The T.C. has asked the Electric Supply Co. to quote terms for lighting the town.

**Whitehaven.**—The T.C. has decided to submit a tender for lighting the harbour by electricity.

**West Calder.**—In connection with the new bakery of the West Calder Co-operative Society, a gas-driven electrical generating plant has been installed for power and lighting purposes; the society lights the village streets free of charge.

**Worcester.**—It has been decided to erect 12 additional arc lamps in the city, and 57 Osram lamps to replace 73 gas lamps. These will give a candle-power of 13,500 against 3,500 by gas, and the alteration will cost £480, which will be met by the Electricity Committee. In order to contribute towards the outlay, the Watch Committee has decided to pay £250 a year for the lighting, against £229 for the gas lamps.

## TRAMWAY and RAILWAY NOTES.

**Bacup.**—The B. of T. inspection of the new electric tramways was made on Tuesday by Col. Druitt. The official and public opening of the Bacup tramways (2¾ miles) to Thornton, near Waterfoot, is fixed for to-day (July 23rd). A banquet follows at the Bacup Mechanics' Institute on the invitation of the Mayor and Mayoress. This completes the electrification of the Rossendale Valley Steam Tramways. The Bacup contract amounted to £36,500, and the Rawtenstall sections to £145,000.

**Barnet.**—The Sub-Committee of the Herts County Council has paid a final instalment of £218 to Messrs. Dick, Kerr and Co., Ltd., in connection with their contract for the construction of a light railway at Barnet. This, with the expenditure previously incurred, makes a total of £22,018, or £28 in excess of the amount authorised by the County Council.

**Bradford.**—The final balance-sheet of the tramways department shows a net surplus of £15,318, as compared with £17,238 in the previous year; the amount, as usual, goes to strengthen the reserve and renewals fund. Some £20,000 has been appropriated from the account for the relief of the current year's rates, and it now stands at £24,000. The total amount disbursed for repairs and renewals of all kinds during the year reached £31,189, which sum included a sum of £24,000 drawn from the renewals fund, expended on the permanent way.

**Continental Notes.**—Sweden.—The members of the Government Committee on Waterfalls are visiting Swedish Lapland this summer and inspecting the various waterfalls there. At the same time Director Ofverholm, of the electrical department of the railways, is travelling there with the view of examining the local conditions with regard to the projected working of the railway to Narvik, in Norway, by means of electricity. The director of the Department of Waterfalls, Colonel Hansen, has already expressed himself in favour of the erection of a large power station in Lapland by the Government, and says that this plan will shortly be realised. The energy will be used partly for industrial purposes and partly for supplying the Ofoten Railway with power, when coal will be replaced by electricity.

TURKEY.—A new company has lately been formed in Zurich, with a capital of £480,000 and the title La Union Ottomans, to develop electrical undertakings in Turkey and Asia Minor.

PORTUGAL.—The tramway employés who struck work at Oporto, have now arrived at a satisfactory settlement with the company and returned to work.

**Dundee.**—The gross receipts of the Corporation tramways for the year ended May 15th last were £62,830, and the working expenses, including maintenance of lines, &c., amounted to £41,350, leaving a balance of £21,479. The mileage run was 1,381,242, an increase of 49,690 miles over the previous year, and the passengers carried were 16,658,073, an increase of 481,939. The receipts were £2,257 in advance of last year. The total capital expenditure on the undertaking to May 15th was £337,423.

**Handsworth.**—The Tramways Committee has submitted the award of Mr. H. Graham Harris, who was appointed referee by the B. of T. to settle the price to be paid by the Council for the part of the City of Birmingham Co.'s tramways in the Council's area. The Committee has approached the company in regard to the lease of the tramways until June 30th, 1911.

**Huddersfield.**—A movement is on foot on the part of tramway managers to introduce a new type of tramway car, with a view chiefly to the abolition of the confusion and delay arising when outgoing and incoming passengers meet at the same door. Huddersfield Corporation has just decided to try a type designed by Mr. P. Kavanagh, of Liverpool, in connection with an order it is about to place for rolling stock, while both Sheffield and Huddersfield are introducing on their existing cars a novel system of top-deck seating, also designed by Mr. Kavanagh. The leading feature of the car design is an automatically-worked safety arrangement, whereby passengers may enter and leave simultaneously.

**Hull.**—The report of the Corporation Tramways Department for the year ended March 31st last, shows that some 32,958,883 passengers were carried and 3,379,117 car-miles run. The gross income amounted to £129,899 and the working expenses to £79,765, leaving a gross profit of £50,134; out of this the sums of £13,786 and £9,321 were required for interest and sinking fund respectively, £18,000 was allocated for the relief of rates 1909-10, and the balance of £6,319 was placed to reserve. The department operates its own power plant at a total running cost of £11,722, or ·83d. per car-mile; 4,324,609 units were generated, and an additional 9,440 units purchased from the electricity department. The passengers carried comprised 28,913,755 at 1d. and 4,045,128 at ½d. The department has a reserve fund of £96,163.

**Kilmarnock.**— The report by the electrical engineer and tramway manager submitted to the last meeting of the T.C., showed that during the past year there was a profit of £148 on the electric light and deficit of £2,009 on the cars. In the course of a long discussion on car fares and stages, it was decided to issue return tickets between Kilmarnock and Harlford.

**London.**—L.C.C.—The Highways Committee has issued a comprehensive report on the working of the tramways during the period ending March 31st last. From this it appears that at that date the system extended over 127⅝ street miles, being 85⅝ miles electric, and 42 miles of horse lines, all worked by the Council, except two short lengths (⅜ mile) in Highgate and Leyton. The capital expenditure on the undertaking, up to March 31st last, was £9,483,562, of which £1,068,971 represents expenditure during the year. The receipts and working expenses during the year were, in the case of electric traction, £1,572,251 and £896,286 respectively; in the case of horse traction, £275,199 and £305,402 respectively, the surplus on the whole system being £645,762, after deducting the deficiency of £30,203 on the horse lines. From this surplus, interest and sinking fund absorb £523,101, and other charges swell the latter figure to £538,192, leaving a net balance of £107,570. In June last the Council decided to provide ¾d. per car-mile for renewals (on the electrical mileage), and this absorbs £88,785, the remainder of the net balance going to the same fund towards deficiencies in past contributions. The total operating expenses for electric traction were 6·74d. per car-mile, as compared with 6·79d. in 1907-8. The number of passengers and the car-miles run were as follows: Electric, 344,705,937 and 31,962,784; horse, 68,207,904 and 7,156,688 respectively.

The Highways Committee recommends that it be authorised to deal with any tenders which may be received during the summer recess in connection with two 1,500-KW. rotary converters for the Elephant and Castle sub-station; also in connection with the reconstruction of the Highgate Hill cable tramways, for which the track work, &c., is estimated to cost £18,920; and in connection with the reconstruction of tramways from Beresford Square to Nile Street, Woolwich, on the overhead system, at a cost of £5,350.

The Highways Committee, in a further report, recommends that authority be sought in the session of Parliament, 1910, for the construction of additional tramways, amounting to 23 miles single line, partly on the conduit and partly on the overhead system, the cost being estimated at £417,080, exclusive of cars, &c.

The Finance Committee reports, in connection with the above, that it has not yet been decided what proportion of the cost of street widenings shall be chargeable to the Tramways Account, and that the financial results estimated for are irrespective of debt charges in connection with widenings, which may in future be charged against tramways account. In view of the large aggregate cost of the street widenings concerned and the fact that local traffic would benefit largely, the Committee considers that the Council would not be justified in proceeding with any of the schemes, unless the local authorities were prepared to contribute one-third of the cost of street widenings, as proposed by the Improvements Committee.

**Morecambe.**—The T.C. on Monday decided to apply for a loan of £9,000 for tramway purposes.

**Rochdale.**—The line to Milnrow and Newbey was again discussed at great length by the Milnrow District Council on the 14th inst., and a resolution was passed by the Council in favour of obtaining a prov. order similar to that secured by the Whitworth District Council.

**Transvaal.**—The Johannesburg municipality is considering a recommendation by the Tramways Committee to spend £100,000 on suburban extensions.

**U.S.A.**—About 18 months ago the first tube railway under the Hudson River, between Manhattan and Jersey City, was opened for traffic. On Monday last the second pair of tubes were opened, and a third pair, which is being built for the Pennsylvania Railroad, is nearly finished.

**Watford.**—At a meeting of the Herts County Council on Monday, the Council approved of the estimate of £37,990 for the construction of the Watford Light Railway from the terminus at Callow Land, *vid* St. Albans Road, Station Road, Woodford Road, Queen's Road and High Street, to a point near the London Road. It also sealed the agreement with the Metropolitan Electric Tramways, Ltd., for a 42-years' lease from August 21st, 1908.

**Woking.**—The Woking and Bagshot Light Railway Co. has applied to the B. of T. for an extension of time for carrying out the Light Railway Order, 1906. The Woking U.D.C. has decided to offer no objection.

## TELEGRAPH and TELEPHONE NOTES.

**Imperial Telegraph Rates.**—At a committee meeting of representatives of telegraph administrations transmitting telegraph traffic "*Via* Eastern" and "*Via* Teheran" between Great Britain and India, Australasia, and South Africa, Reuter's Agency is informed, the following resolution was approved—namely, "That provided the British, Indian, and Colonial Governments are prepared to take their rateable share of the reduction, the Press rate between Great Britain and India, Australasia, and South Africa be reduced to 9d. per word from August 1st next."

**Persia.**—According to the *Daily Telegraph*, the telegraph staff of the Indo-European Telegraph Co. in Teheran recently underwent four days of continuous duty under siege conditions. The offices were under fire throughout the entire fighting, and though the windows were barricaded, fragments of shell found their way in, and the whole of the staff were exposed to considerable danger. Fortunately, there were no casualties among the staff of the company, who displayed praiseworthy devotion in grappling with increased traffic under extremely dangerous conditions.

**Strike in Mexico.**—The telegraph operators of the railroads have struck for higher wages, and against the instructing of Mexican apprentices.

**Telegraphic Interruptions and Repairs:—**

| | Interrupted. | Repaired. |
|---|---|---|
| Dakar-Conakry .. .. .. .. | May 13, 1909 | July 18, 1909 |
| Tangier-Cadiz .. .. .. .. | May 19, 1909 | |
| Cayenne-Salinas .. .. .. .. | June 7, 1909 | June 28, 1909 |
| Assab-Perim .. .. .. .. .. | July 8, 1909 | |
| Bolama-Bissao .. .. .. .. | July 15, 1909 | July 15, 1909 |

**Telephonic Communication with the Continent.**—The *Times* states that the Postmasters-General of Spain and France have just signed an agreement which will provide direct telephonic communication between the two countries. When the work is completed it will be possible to speak, not only to Madrid, but to almost any town in Spain from either Brussels, Paris, or London. Four new circuits are to be laid—namely, Bordeaux—Madrid, Cette—Barcelona, Bayonne—San Sebastian, and Perpignan—Gerona. Each of these four systems will be in direct connection with the whole of the telephone systems of both France and Spain. The Spanish part of the cost will appear in the supplementary estimates; that of France is estimated at £24,000.

**Wireless Telephony.**—As a result of representations made by the company which supplied the wireless telephone equipment to the United States battleship fleet prior to its cruise around the world, the U. S. Navy Department is making an investigation of the alleged facts upon which a report condemnatory of the wireless telephone equipment was based. Although this report condemned the wireless telephone as useless, an officer on one of the ships has stated that, by its means, conversation could be maintained between ships 10 and 15 miles apart. The guarantee of the company which supplied the apparatus was limited to a radius of five miles, and it is claimed that the system was actually successful over this range. —*Electrical World.*

# CONTRACTS OPEN and CLOSED.

## OPEN.

**Altrincham.** — July 30th. Electrical installation at the new Higher Elementary Schools, Hale (deposit, £1 1s.). J. Howarth, Clerk, Education Department, Altrincham, Cheshire.

**Australia.** — Melbourne. — August 4th. Overhead travelling crane for the Council. See "Official Notices" June 11th.

Ten 100-number switchboards for the Postmaster-General's department in New South Wales. See "Official Notices" July 16th.

New South Wales.—Telephone material for the P.M.G. See "Official Notices" to-day.

**Barnstaple.**—July 28th. Electric light installation at the workhouse and cottage homes, for the B. of G. Workhouse Master.

**Blackburn.**—July 26th. The Electricity Committee requires tenders for steam coal for the ensuing 12 months.

**Bradford.**—July 30th. Eight automatic point controllers for the Tramways Department. See "Official Notices" July 9th.

**Canada.**—Winnipeg.—August 2nd and 16th. The city of Winnipeg is advertising for tenders for the hydraulic and electric equipment of the generating station now under construction on the Winnipeg River, at Thirty-foot Falls. Some particulars were given in this column on July 2nd.

**Dublin.**—July 26th. Machinery oils for the Corporation electricity works. See "Official Notices" July 16th.

**Edmonton.**—July 28th. Private telephone equipment at the infirmary. See "Official Notices" July 16th.

**France.**—Paris.—August 18th. The Under-Secretary for Posts and Telegraphs, 103, Rue de Grenelle, Paris, requires tenders for 75 stamping machines worked by electric motors.

August 11th.—The Direction de la Manufacture d'Armes at Châtellerault (Vienne) requires tenders for cables, copper wire, and dynamo construction material (11 lots).

August 5th. The Under-Secretary for Posts and Telegraphs, 103, Rue de Grenelle, Paris, requires tenders for telegraph apparatus and accessories; also by August 3rd for a number of tools required to repair telephone and telegraph installations and apparatus.

**Germany.**—August 4th. The gas, water and electricity authorities in Dresden are inviting tenders for the supply and erection of two 700 kw. dynamos.

Cologne.—August 25th. The Municipal Council requires tenders for four electrically-driven cranes.

**Hull.**—July 28th. Electric and gas light fittings for the new Public Hall of the Corporation. See "Official Notices" July 16th.

**Hull.**—July 29th. Electric lighting mains extensions for the year, for the E.L. Committee. See "Official Notices" July 9th.

**Italy.** — August 10th. The Italian State Railway authorities in Rome are inviting tenders from foreign as well as from home makers for the supply of 100,000 metres of telegraph cable.

August 18th.—The Italian State Railway authorities in Rome are inviting tenders for the supply of six electrically-operated drop hammers.

**Keighley.**—August 7th. Two 1,000-kw. turbo-alternators with condensers, and two water-tube boilers for the electricity department. See "Official Notices" July 16th.

**Leyton.**—July 27th. Electric light installation for Sybourn Street School for the U.D.C. Education Committee. Architect, Mr. W. Jacques, 2, Fen Court, Fenchurch Street, E.C. (deposit, £1).

**London.**—G.P.O.—August 9th. Creosoting telegraph poles for the P.M.G. Mr. G. Morgan, Controller of Stores, 17-19, Bedford Street, W.C.

**Manchester.**—July 27th. Lighting cable for the Tramways Committee. Mr. McElroy, general manager.

**Pontypridd.**—July 27th. One 500-kw. steam dynamo for the U.D.C. See "Official Notices" July 16th.

**Russia.**—September 13th. The municipal authorities of Bachmouth (Government of Ekaterinoslav) are inviting tenders for the concession for the public electric lighting of the town.

**Spain.**—August 26th. Sixty years' electric tramway concession (between Monachil and the suburbs of Gabia Grande, Granada province). Tenders, with £130 deposit, to Direccion General de Obras Publicas, Madrid.

**West Ham.**—The Education Committee is to obtain tenders for installing electric light throughout the Abbey School. The architect's estimate is £375.

## CLOSED.

**Australia.**—According to the *Australasian World*, a tender has been accepted by the Commonwealth Government for a common battery switchboard at Hobart from the Western Electric Co., Sydney, the price being £4,728 for the board and 770 sets of instruments.

**Bedford.**—The T.C. has accepted the tender of Messrs. Edwin Danks & Co. (Oldbury) for a 30 ft. by 8 ft. Lancashire boiler, with superheater and pipework, for £659 10s.; and of Messrs. W. H. Allen, Son & Co. for condensing plant and pipework for £1,169.

**Belgium.**—Eight concerns, including Messrs. Bruce, Peebles & Co., of Edinburgh, submitted offers to the Société Nationale des Chemins de Fer Vicinaux, of Brussels, for the supply and erection of the plant necessary for a transformer sub-station in connection with the Spa-Verviers electric railway. The lowest was that of the Société Westinghouse, of Paris.

**Cleckheaton.**—The Council has accepted the tender of the Tudor Accumulator Co., Ltd., for the supply and maintenance of a battery of 260 cells with a capacity of 540 ampere-hours.

**Egremont.**—The tender of Mr. W. Harris, Liverpool, has been accepted for the electric lighting, &c., of the Wallasey Skating Rink Hall in King Street, Egremont, Cheshire.

**Ilford.**—The U.D.C. has accepted the tender of W. Griffiths & Co. for tramway works in Ilford Lane at £1,465 3s.; and that of Hammond & Miles, Scrafton Road, Ilford, for tramway shed extensions at £1,892.

**London.**—The Post Office authorities have accepted the following tenders:—

Supplying and laying feeder cables, Blackfriars, E.C.—Western Electric Co.
Supply and install telephone exchange equipment at Willesden.—General Electric Co., Ltd.
Cable, paper core.—Western Electric Co., Ltd.
Wire, copper, hard-drawn.—British Insulated and Helsby Cables, Ltd.; Elliott's Metal Co., Ltd.; Richard Johnson & Nephew, Ltd.; T. Bolton and Sons, Ltd.; Shropshire Iron Co., Ltd.; Frederick Smith & Co., incorporated in the London Electric Wire Co. and Smiths, Ltd.; John Wilkes, Sons & Mapplebeck, Ltd.
Wire, copper, annealed.—T. Bolton & Sons, Ltd.
Bends, split and couplings.—Jones & Attwood.
Perforators, keyboard, Gell.—Gell Telegraphic Appliances Syndicate, Ltd.
Cable, paper-core.—Callender's Cable and Construction Co., Ltd.; Henley's Telegraph Works Co., Ltd.

The Metropolitan Water Board has accepted the tender of Messrs. Glenfield & Kennedy, Ltd., at £450, for electrical water-level instruments and line wiring, &c., for the same, at the Beachcroft reservoir.

Bermondsey.—The B.C. has accepted the following tenders for the electricity works:—

Davidson & Co., exhaust fan, £72; Browning & Co., Ltd., forced-draught fan, £19.

Stoke Newington.—The B.C. has accepted the tender of the Reason Manufacturing Co. for demand indicators, and of Messrs. Crompton & Co., at £150, for the provision and erection at Edwards Lane station of a balancing machine, designed to give increased output from, and to improve the efficiency of, the generating plant at the destructor.

Southwark.—The B.C. received the following tenders in connection with the electricity undertaking:—

Addition to generating station to be used as a battery room:—

| | | |
|---|---|---|
| Battley, Sons & Holness | | £1,147 |
| F. & H. F. Higgs | | 1,190 |
| William Downs | | 1,177 |
| **John Marsland & Sons** | (accepted) | 1,120 |

Erection and maintenance of battery:—

| | | |
|---|---|---|
| Hart Accumulator Co., Ltd. | | £395 |
| Chloride Electrical Storage Co., Ltd. | | 390 |
| Tudor Accumulator Co., Ltd. | | 351 |
| D. P. Battery Co., Ltd. | | 280 |
| Premier Accumulator Co., Ltd. | | 262 |
| **Electrical Power Storage Co., Ltd.** | (accepted) | 247 per annum for 15 years. |

Supply and fixing of four superheaters:—

| | | |
|---|---|---|
| Davey, Paxman & Co. | | £6 5 |
| Babcock & Willcox | | 498 |
| **Hosnan & Froude** | (accepted) | 420 |

110 yards of 3 by 3 by 125 paper-insulated and lead-covered cable:—

| | | |
|---|---|---|
| B.I. and H. Cables, Ltd. | | £56 |
| Johnson & Phillips, Ltd. | | 57 |
| Siemens Bros. & Co. Ltd. | | 57 |
| **Western Electric Co.** | (accepted) | 56 |

L.C.C.—The Highways Committee recommends the acceptance of the tender of W. Cory & Son, Ltd., for 130,000 tons of coal for the Greenwich generating station for 12 months, at 11s. per ton, with demurrage at the rate of 2d. per ton for each day after two days.

**Maidenhead.**—The T.C. has accepted the tender of the Diesel Engine Co., Ltd., for the supply of a 150-kw. Diesel-E.C.C. generating set.

**Salford.**—The T.C. has accepted the tender at £719 of Cleworth & Robinson for the erection of a battery house and alterations to the existing buildings at the Frederick] Road electricity works.

**Stretford.**—The D.C. has accepted the tender of Messrs. E. Green & Sons, Ltd., for the replacement of the first cold-end group of the economiser, consisting of 80 tubes and boxes, for £144 10s., and for the replacement of any other sections that may be required at £12 10s. each.

**Sunderland.**—The Corporation has ordered 70 electric tramway meters from Messrs. Chamberlain & Hookham, of Birmingham, at a cost of £3 5s. each. The chairman of the Tramways Committee said the meters would soon pay for themselves by the saving of current which would be effected through the rivalry of motormen in keeping down consumption.

**Swinton and Pendlebury.**—The U.D.C. has accepted the tender of Callender's Cable and Construction Co., Ltd., for the extension of the lighting mains at £181.

**Worksop.**—The U.D.C. has accepted the tender of W. T. Glover & Co., Ltd., for cables, £354.

## FORTHCOMING EVENTS.

**Institution of Mechanical Engineers.**—Monday, July 26th, to Friday, July 30th. At Liverpool. Summer meeting. Reading and discussion of papers. Visits to the Southport Electrified Railway; Liverpool Corporation Electricity Works; Messrs. Cammell, Laird & Co.'s Works; the English McKenna Process Co.'s Steel Rolling Mills; the Mersey Railway Co.'s Generating Station; L. & Y. Railway Co.'s Locomotive Works, Horwich; and Messrs. Dick, Kerr & Co.'s Works, Preston.

## NOTES.

**The Thwaite Fund: Mr. Carnegie's Donation.**—It is with considerable satisfaction that we learn that the Committee of the B. H. Thwaite fund has now received from Mr Carnegie a cheque for his generous contribution of £500. The condition which was attached to Mr. Carnegie's offer—namely, that a further £500 should be forthcoming from subscriptions from those who recognised the value of the services rendered to certain departments of science and industry by the late Mr. Thwaite—has not been complied with up to the hilt, it is true, as the subscriptions did not reach a quite equal sum; but Mr. Carnegie has not allowed the actual cash shortage to stand in the way. He was doubtless influenced in his decision by the successful efforts of the Committee in regard to Mr. Thwaite's son, aged nine, who has been elected to the Yorkshire Society School. If this benefit could be capitalised, it would represent many times the shortage in the subscription total. We understand that arrangements are in progress for placing Mr. Thwaite's daughter in a suitable school. The Committee are desirous of expressing, through our pages, their gratitude to Mr. Carnegie for his generosity and kind consideration, to all who by their subscriptions have helped to make up the required sum, and to those who have so substantially assisted by placing the deceased gentleman's son in the above school. In the last-named connection, special thanks are due to Mr. George Mellor, the secretary of the Association of Yorkshiremen in London, of which Association the late Mr. Thwaite was a founder.

**Quite Right Too.**—Hampstead Borough Council had under consideration at its meeting last week the question of employés soliciting from contractors and others subscriptions towards beanfeasts. The obvious objections to the practice were pointed out, and it was resolved to instruct the borough engineer to have notices put up and kept posted in the depôt and other places, warning employés that the soliciting or accepting of gratuities of any kind, under any circumstances, is prohibited and renders them liable to dismissal, and that the rule will be strictly enforced.

**Electrical Territorials.**—The Lancashire Fortress R.E. (Territorials), which absorbed the old Volunteer Electrical Engineer Battalion, left Liverpool on Saturday for the annual camp training. Under the present responsibilities of the corps, Col. Langdon's command, for camp purposes, has been split up this year, and the experience will be, no doubt, of value to the units concerned. One half of the battalion is on the old camping ground over the Mersey, at Wallasey, while the other two companies have crossed the Channel for particular service in Ireland.

**Henry Saxon Snell Prize Competition.**—The Royal Sanitary Institute has appointed Prof. Henry Adams, M.Inst.C.E., F.S.I., Dr. Louis C. Parkes, M.D., D.P.H., Prof. W. Napier Shaw, D.Sc., M.A., F.R.S., and Mr. A. Saxon Snell, F.R.I.B.A., as the adjudicators for the next "Henry Saxon Snell Prize" Competition, the subject set being "The Principles of Heating and Ventilating Public Buildings." The essays have to be delivered at the Institute, 90, Buckingham Palace Road, by August 31st.

**Inquiries.**—Makers of the "Climax" carbon-filament lamp are asked for.

**Institution and Lecture Notes.**—Lecturing on "Steel" to the convention of the Permanent Way Institution at Sheffield on Saturday, Prof. McWilliam, of Sheffield University, referred to the fact that the electrification of railways was resulting in the rapid wearing away of rails, and therefore builders of permanent way would have to come to Sheffield for steel. There was, for instance, manganese steel, which had a very long life, though of course raising the amount of manganese raised the price. Mr. Willox, engineer of the Metropolitan Railway, said he thought the addition of silicon in the manufacture of steel had increased the life of the rail 110 per cent.

Institution of Electrical Engineers.—A special general meeting of Members, Associate Members and Associates is to be held at the offices of the Institution on Thursday next, at 5 p.m., for the purpose of considering, and, if approved, of passing resolutions authorising and confirming the action of the Council in borrowing the sum of £26,000 from the Economic Life Assurance Society on the security of the leasehold property of the Institution on the Thames Embankment, and authorising the expenditure of a sum not exceeding £20,000 on structural alterations, furniture, and fittings in connection with the Institution Building, the Council to make such financial arrangements (including the borrowing of money on the security of the Institution Building and of the Institution property in Tothill Street) as it may consider necessary for the purpose.

Institution of Mining Electrical Engineers.—Meetings of the Yorkshire and Notts branches of the Institution will be held tomorrow, July 24th, at the Victoria Station Hotel, Sheffield, and the Welbeck Hotel, Nottingham, respectively, both at 5 p.m. The business on the agenda at each meeting will be the appointment of local officers, &c., and all those locally interested in the formation and progress of the Institution are invited to attend.

Arrangements have now been completed for the important conference to be held in Liverpool under the auspices of the Institution of Mechanical Engineers. Among the papers to be read at the gathering, which begins on the 27th inst., are "Hydraulic and Electrical Appliances on the Liverpool Dock Estate," by Mr. Alaric Hope; and "Electrical Driving in Textile Factories," by Mr. Herbert W. Wilson.

Institute of Metals.—The Institute has just completed the first year of its existence, during which period the membership has increased to more than 500. The first volume of the *Journal* of the Institute is now in the hands of all members, and shortly they will receive notification of the forthcoming Autumn meeting, which will take place at Manchester on October 14th and 15th. A series of about half a dozen papers of great interest will be read and discussed. When Sir William White retires from the presidency at the end of the present year, it is almost certain that Sir Gerard Muntz, Bart., will be nominated to the vacant office. Dr. H. C. H. Carpenter has been elected vice-president.

**Portrait of Sir Chas. Bright.**—We understand that a number of copies of the portrait which formed the frontispiece of the abridged biography of Sir Chas. T. Bright, by his son, Mr. Chas. Bright, F.R.S.E., recently reviewed in our columns, have been mounted suitably for framing, and can be obtained from the publishers, Messrs. Constable & Co., at a nominal price.

**Will.**—It is stated in the daily Press that Major W. M. Mackenzie, a director of Callender's Cable and Construction Co., Ltd., and other companies, left estate of the gross value of £26,099, with net personalty £26,173.

**Charge of Embezzlement.**—It is reported that a recent investigation into the affairs of the Airdrie and Coatbridge Tramway Co., whose headquarters are in London, led to the suspension of Mr. Arthur Delves, who has been manager of the tramways since they were opened some years ago. A Sheriff's warrant was subsequently issued for the arrest of Mr. Delves on a charge of embezzling funds belonging to the company. Mr. Delves gave himself up to the police at Birmingham.

## OUR PERSONAL COLUMN.

*The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* Electrical Review *posted as to their movements.*

**Central Station Officials.**—The salary of Mr. Calvert, electrical engineer, of Finchley, is to be increased from £475 to £500 per annum, dating from the 1st inst.

Mr. A. C. Gilling, who for some time has had charge of the Epsom U.D.C. electricity undertaking as acting engineer, has been appointed resident electrical engineer at a salary of £200 per annum, rising by annual increments of £10 to £250.

**Tramway Officials.**—The Morecambe T.C. on Monday rejected the recommendation of the Tramways Committee to appoint Mr. Carleton, an ex-alderman of the Council, as tramways manager.

Mr. M. Harold Curry, who was appointed assistant manager of the Coventry Electric Tramways Co. in April last, was married on July 1st to Miss J. M. Buffham, of Belsize Park, Hampstead. Amongst the presents was a barometer from the staff of the tramway company.

**General.**—According to the *Times*, the Council of King's College have elected Mr. C. G. Barkla, D.Sc. (Liverpool),

Professor of Physics, in succession to Prof. Harold Wilson, F.R.S., who has accepted an appointment in McGill University, Montreal.

Mr. F. B. C. B. Roe, of Lincoln, a member of the Electrical Contractors' Association, was married recently to Miss Elsie MacBrair, daughter of the city surveyor of Lincoln.

Mr. T. L. Miller has been re-appointed consulting engineer to the Stretford electricity undertaking for one year from November last.

Mr. George Gregory, late of the General Electric Co., Ltd., and now of the Electric Battery Co., High Holborn, was married last Saturday at St. Andrew's Church, Stoke Newington, to Miss Olive Hawes.

Messrs. James E. Sayers & Caldwell, consulting engineers and electricians, announce that they have removed to new offices at 190, West George Street, Glasgow.

We learn that Mr. A. Henderson (late of Messrs. John Brown and Co., Ltd., Clydebank) has been appointed electrical engineer to Messrs. Scotts' Shipbuilding and Engineering Co., Ltd., Greenock, to organise a new electrical department to carry out the electrical work on the new British battleship H.M.S. *Colossus*, which the firm is building.

The *Daily Telegraph* reports that Mr. Thomas Cleghorn Baillie, M.A., D.Sc., at present head of the physics and electrical engineering department at Sunderland Technical College, and assistant-lecturer and demonstrator in physics and electrical engineering at University College, Bangor, has been appointed principal of the Croydon Polytechnic, in succession to Dr. Beckit Burnie, who goes to Brighton.

Mr. H. T. G. Edmonds, of the Mersey Railway power house, Birkenhead, has been presented by the staff with a 400-day clock on the occasion of his marriage with Miss M. E. McFadden, of Higher Broughton, Manchester.

**Obituary.**—Mr. J. A. Booth.—The death occurred on Sunday, in his 49th year, of Mr John Alfred Booth, of the firm of Joseph Booth & Bros., Ltd., electrical crane manufacturers, Union Works, Rodley, Leeds.

We regret to see from the *Times* announcements that Mr. John Brailsford Bright, eldest son of the late Sir Charles Tilston Bright, passed away on 17th inst., at the age of 55 years.

## CITY NOTES.

### Chili Telephone Co., Ltd.

On Thursday last week Mr. George Keith presided over the meeting of this company held at the offices, 42, Old Broad Street, E.C.

In moving the adoption of the report (see Electrical Review, July 9th, page 69) the Chairman said it showed a satisfactory improvement in the company's business, similar to that which took place in the previous year. The currency revenue in Chili had increased about 17 per cent. owing partly to the expansion of business, and partly to the higher rate charged in compensation for the lower value of the Chilian dollar in which they were collected. The proportion of current expenditure to revenue was 48 per cent., or nearly 2 per cent. less than it was in the preceding year. The financial depression through which Chili had been passing since the earthquake in 1906 still continued, and the average of the exchange from the paper dollar was 10d. or about a 1d. less than in the previous year. The result was that the income in Chili after conversion into sterling showed an increase of £3,815, investment and transfer fees had increased £59, while the London expenses and income-tax were practically the same as they were last year. There was no charge for debenture interest as was the case in the previous 12 months, and the net profit for the year was £35,327, which with the £2,777 brought forward gave them an available sum of £38,104. An interim dividend which absorbed £6,600 was paid in January, and £17,683 they propored to place to reserve. The directors now recommended the payment of a final dividend of 5s. per share, which would absorb £11,000, and would make a total distribution for the year of 8 per cent., free of income-tax, and the remaining £2,820 would be carried forward. The sum of £4,288 expended during the year on new stations had been carried to the capital account, and £5,068 on replacement of plant had been taken from the reserve fund. The invested funds, which were taken at cost, stood at £10,329 more. Altogether, he thought he might congratulate the shareholders on the result of the year's business. The company's plant and property at the various centres throughout the country had been considerably extended during the year. Amongst other things, seven new offices had been opened and connected up with the southern district. The currency of the dollar at Chili had fluctuated greatly during the year, and any measure which tended to fix the value of the dollar at a practical figure would be to the commercial and economical interest of the country. The company's relations with the Government and the various local authorities were of the best, and the outlook for the current year was favourable.

The Hon. H. T. Allsopp seconded the motion, and the report was adopted.

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**Held Over.**—Pressure upon our space compels us to hold over until next week our reports of the meetings of the Victoria Falls and Transvaal Power Co., the United River Plate Telephone Co., Ltd., and the National Telephone Co., Ltd.

**Prospectuses.**—*Sungei Kari (Sumatra) Rubber Estate, Ltd.*—An issue of 30,000 shares of £1 each at par has been offered for subscription this week. The company is acquiring the Estate named, which is situated in the Serdang district of Sumatra. 775 acres out of 1,750 are planted with rubber trees.

*Simpang Sumatra Rubber Co., Ltd.*—The list closes to-morrow (Saturday) in an issue of 39,000 shares of £1 each.

*Jamaica Estates and Rubber Plantations, Ltd.*—An issue of 229,900 preferred shares of £1 each, 10 per cent. cumulative and participating, has been offered for subscription.

*Calcutta Electric Supply Corporation, Ltd.*—The list was to close yesterday in an issue of 80,000 5 per cent. cumulative preference shares at £5 each at par. The money is required for mains extensions, and for a new high-tension generating station in the northern district of the city.

*Manaos Tramways and Light Co., Ltd.*—Offers have been invited for sale of £300,000 5 per cent. first debentures to be applied to extensions and improvements provided for in the concession. A report on the undertaking by Messrs. J. G. White & Co., Ltd., who were interested in the original formation of the company, appears in the prospectus. They state that the amount of £16,500 required for the service of the debentures is covered nearly three times over.

*Bakap Rubber Plantations, Ltd.*—This company, which has purchased the Sungei Duri Rubber Estate, in Wellesley, Straits Settlements, has been offering 31,500 shares of £1 each for subscription.

*United Sua Betong Rubber Estates, Ltd.*—An issue of 38,000 shares of £1 each has been offered by this company, which acquires properties in the Federated Malay States.

**Newcastle-upon-Tyne Electric Supply Co., Ltd.**—The directors have issued a circular to shareholders, stating that the profits for the first six months of the current year, as shown by the cost sheets, amount to £47,259, which, after including the balance brought forward from last year and deducting interest on loans, debentures, &c., represents a net sum of £41,704. Out of this the directors have decided to pay, on the 31st inst., an interim dividend on the preference shares of 2½ per cent., absorbing £17,187. The balance (£24,516), though subject to deductions for depreciation and a sum to be carried forward, would, in the ordinary state of business, permit the declaration of a small interim dividend on the ordinary shares. In view, however, of the critical position of the coal trade and the possible stoppage of, and damage to, other trades which may follow therefrom, the directors do not think it prudent to deal with the balance before the end of the company's financial year.

**London Electrobus Co., Ltd.**—According to an article appearing in the *Financial Times* of July 17th, a circular has been privately distributed among shareholders of the above company, putting forward a scheme for reorganisation. It appears that it is not circulated by the company, but by a private gentleman who has received an option to carry out the scheme, and is asking shareholders to subscribe up to 20 per cent. of their present holdings, in his reorganisation syndicate. This option was to expire on Saturday last.

**Montreal Light, Heat and Power Co.**—A dividend of 1¾ per cent., being at the rate of 7 per cent. per annum for the quarter ending the 31st inst. is announced.

**Mather & Platt, Ltd.**—The directors have declared an interim dividend on the ordinary shares of 5 per cent., free of income-tax, for the half-year ended June 30th last, being at the rate of 10 per cent. per annum.

**Anglo-Malay Rubber Co., Ltd.**—The directors have declared a first interim dividend of 12½ per cent. (2s. 6d. per share), less income-tax.

**American Telephone and Telegraph Co.**—According to the *Financial News*, the net earnings for the past six months, after payment of interest and dividends, amounted to $2,462,000, as compared with $2,543,000 for the corresponding period of last year.

**Pataling Rubber Estates, Ltd.**—The directors have declared an interim dividend of 25 per cent. (6d. per share) less income-tax.

**Marconi's Wireless Telegraph Co., Ltd.**—At a special meeting held last week, the resolution which came before the recent annual meeting, altering the articles so as to enable the directors to pay commission on shares, was approved.

**National Telewriter Co., Ltd.**—This company held its statutory meeting on 15th inst., at Oxford Court, E.C., Sir W. Treloar presiding.

**Chelsea Electricity Supply Co., Ltd.**—The directors have declared an interim dividend of 4 per cent. per annum (2s. per share) on the ordinary shares for the past half-year, payable September 15th.

**City of London Electric Lighting Co., Ltd.**—The directors have declared an interim dividend of 5 per cent. per annum (5s. per share), less income tax, on the ordinary shares for the past half-year, payable August 4th.

**Mexico Tramways Co.**—The directors have declared the usual quarterly dividend of 1½ per cent. on the capital stock.

## Edmundson's Electricity Corporation, Ltd.

The twelfth annual meeting of the shareholders of the above company was held on Thursday of last week at Salisbury House, Old Broad Street, under the presidency of Mr. P. Debell Tuckett.

The Chairman, in proposing the adoption of the report (see Electrical Review, July 9th, page 68), said that, dealing with the accounts the first item was gross trading profit, and, as compared with the previous year, that was down by the very substantial amount of £5,235. The main cause of this decline was the reduced capital expenditure of the sub-companies, but though it might be regrettable that greater opportunities for spending capital to advantage should not have presented themselves, the mere failure to increase or maintain the trading profit by virtue of such capital expenditure afforded no ground for regret. A further cause of this decline was to be found in the fact that the private lighting department had not done as well this year as last, when it had in hand the completion of a large Government contract. A third cause, which had adversely affected the trading profits to the extent of some £500, arose out of what he could only describe as iniquitous book-keeping by one of the Urban Co. undertakings some years ago. Losses, which should have been disclosed and met at the time, were suppressed by means of fictitious or otherwise improper debits to capital, and they had accordingly to be dealt with now that they had been brought to light. The engineer responsible for these discreditable manipulations was unsatisfactory in many other respects, and, with the book-keeper in question, had long since left their service. Since the accounts were made up, he regretted to say they had reason to fear that a similar state of affairs would be disclosed in the case of another Urban Company undertaking, for the management of which the same engineer was responsible. Interest on temporary loans was up some £400, as was natural owing to the prior lien issue last year. Dividends and interest from investments and advances had increased by £2,124, or 8·3 per cent., an increase which, taking into consideration the prevailing conditions of the past year, must, he thought, be regarded as reasonably satisfactory. The reduction of only £387 in the amount of the Urban Co. guarantee, was the one feature of the accounts which was distinctly disappointing. The gross profits of the Urban Co. increased by £1,667, but this compared with an increase for the previous year of £3,845. The special reason for this decline in the rate of increase was found in the position of two of the company's undertakings, Hawick and Twickenham, which, after consistent progress at the rate of something like £2,000 a year between them, this last year actually contributed £1,464 less profit than for the previous year. In both cases this set-back was due to causes largely or wholly beyond their control. They would notice that the basis, on which the Urban Co. guarantee was calculated, was now set out on the face of the accounts. The net profit of £597 carried to the balance-sheet was, of course, most unsatisfactorily small, providing as it did so bare a margin over the amount of the debenture interest. They knew now, as they knew a year ago, that the company was far from being in the position in which they would wish to see it. Nevertheless, they believed that henceforward the amount of the net profit would steadily increase, and in other respects the company was undoubtedly in a far more satisfactory position than it was. Turning to the balance-sheet, it would be seen that investments and advances had increased by £49,398, whilst the reserve against investments had been increased by £409. This year there was a further item of £26,000, investments in Corporation, Colonial and railway stocks. These consisted of short-dated securities of the highest character, and constituted a temporary investment of their surplus funds. On the other side of the account, liabilities had increased by the amount of the prior lien debenture issue, the expenses of which had been deducted from the balance at credit of profit and loss account, leaving, with this year's addition of £597, a balance of £14,809 to be carried forward. Turning to the schedule of investments and advances, they found that their advances had increased by £36,669, and their debentures by £14,000, whilst their share holdings had decreased by £3,470. The alteration in the amounts of their share and debenture holdings arose out of their recent subscription for Lancashire Power Construction Co.'s debentures. Instead of subscribing for £27,500, the maximum amount which he promised them a year ago not to exceed, they had substituted £1,735 debentures for a similar amount of "B" shares, and had increased their holding in the company by £1,235 less than the stipulated maximum amount of £27,500. With reference to the present position of the Lancashire Power Co., last year's trading showed a loss of £3,809, this year's trading was expected to show a small profit, whilst next year it was expected that sufficient profit would be earned to more than cover the debenture interest. The business was, of course, seriously affected by the strike in the cotton trade last autumn, and continued to be adversely affected by the depression which still prevails in that trade, and in the general trade of the district, largely dependent as it was on the prosperity of that trade. At the moment the company was making neither profit nor loss, but, in so far as it had now eliminated the loss at which it had hitherto been working, he hoped it might be considered to have at last turned the corner. Of the increase of £36,669 in the amount of their advances, the Urban Co. accounted for £32,465, and in this connection he would again like to point out the effect of the adoption of a more liberal depreciation policy by the sub companies in reducing the amount of their advances in the case of the Alderley, Isle of Wight, Lymington and Wycombe companies, in spite of increased capital expenditure by all those companies, whilst similarly in the case of the other companies the amount of the additional advances was reduced below the amount of the respective expenditure. The capital expenditure had increased by £52,081, or by 1·9 per cent., as against £69,065, or 2·6 per cent., a year ago. Lamp connections had increased by the equivalent of 100,144 33-watt lamps, or 8·7 per cent., as against 121,845 or 11·9 per cent. a year ago. In both cases this diminished increase must to some extent be attributed to their policy of restricting free wiring, on which only £3,038 net was expended this last year, as against £8,076 for 1907, and £25,130 for 1906, but the growing use of the new lamps, of which they required a disproportionately increased connection to give them an equivalent load, had, no doubt, contributed materially to bring about this result. Moreover, as time went on, he thought they must expect the business to develop at a somewhat slower rate, since the scope for profitable extension necessarily tended to diminish. In connection with the increase of £6,883 in gross profits, it was satisfactory to notice that with the exception of Frome, which showed a small decrease of £5, and which was one of their least successful and least promising undertakings, Winchester, Salisbury and Newmarket were the only towns which failed to show some progress. These were three of their oldest undertakings, and consequently it had been more difficult in their case to counteract the effect of metallic-filament lamps and the other influences—the fine weather and the bad trade—which had adversely affected their revenues. The outstanding feature of the past year's accounts was to be found in the fact that the increased profits had been derived more largely from reduction of costs than from expansion of revenue, and this in spite of the connection of the equivalent of an additional 100,000 33-watt lamps. This result was due, not to any failure on the part of the new connections to yield an adequate revenue, but to a diminution of the revenue derived from the old connections. The prevailing conditions of the past year had undoubtedly been peculiarly adverse, not only for them, but for almost all similar businesses, and he could assure them that the results realised for the past year had only been realised by the most strenuous and sustained effort on their part and that of the entire staff. These efforts would not be relaxed, but so far as the immediate future was concerned, though he saw no reason to suppose that they would not continue to make steady progress, he thought it would be unwise to anticipate that that progress was likely to be otherwise than slow. Costs were now in most cases reduced within measurable distance of the limit of possible reduction, whilst the increasing use of the more efficient lamps was not at the moment conducive to a rapidly expanding revenue. They were, however, doing their utmost to try and minimise the adverse effect of their adoption by their existing consumers, and this year, at any rate, they had, in cheaper coal, a favourable feature of which they could not be deprived, unless a general coal strike should prevent them from claiming the benefit of the contracts into which they had entered. He would like to say a few words about the work of their private lighting department, which was the original business of Edmundsons 30 years ago, and for which they enjoyed, and, he believed, always had enjoyed, the highest reputation. At the present time they enjoyed a large and valuable connection, and it was through the personal recommendation of former customers that the vast bulk of their orders came, but they felt that, if the business was to be maintained and increased, it was necessary for them to pursue a more active policy, all the more so now that most of the large country houses were already provided with installations, and now that their cost was so much reduced, and they not only needed twice as much work to yield them the same profit, but found every petty wiring contractor all over the country regarding himself as competent to undertake the work. They had, therefore, resumed advertising during the past year to a moderate, and what they believed to be a judicious, extent. Nowadays, the manifold advantages of electric light were generally recognised, but he doubted whether its very moderate cost under existing conditions was as fully realised as it deserved to be. Within the last year or two, thanks to metallic-filament lamps, the material reduction in the cost of a private plant had brought electric lighting well within reach of many people who would not previously have entertained the idea. It was no longer appropriate merely to the large country house. The necessary plant was now so cheap and reliable, the attention required need be so unskilled and trifling that thousands and tens of thousands of comparatively small houses throughout the country might well adopt it. Their's was one of the most intricate and difficult businesses to conduct successfully, with its constantly changing conditions and with the immense amount of detail involved in the adequate and efficient supervision and control of between 30 and 40 stations; and when the work had to be done, as in their case it was essential that it should be done, with a minimum of expense, the difficulty became tenfold greater. It was no easy task to adjust matters so nicely as to combine the maximum of benefit from a centralised organisation with the undoubted advantages of a large measure of local discretion, especially when the majority of the companies in which they were interested had entirely independent boards. In the solution of these and many other problems, Mr. Highfield had been of the greatest assistance to them, and he could not sufficiently acknowledge the debt they owed him for the assiduous care and attention with which he had devoted himself to the task he undertook. Mr. Highfield was a man of exceptional ability, who combined with his well-known technical knowledge two most invaluable qualities, a pronounced commercial sense and a marked sense of proportion, exactly those qualities which were largely lacking in the former management of the company, and he (the chairman) had no hesitation in saying that they were extremely fortunate in having secured his services. He was the very man they needed, and without any disparagement of either Mr. Gripper or Mr. Wigham, both of whom were co-operating with the utmost loyalty in their endeavour to retrieve the mistakes of

the past, he felt it was very largely due to Mr. Highfield's inspiration that they were succeeding, as he fully believed, in putting the business on a very much sounder footing than that on which it previously rested; and without his continued help and advice they would be very sorry to have to face the many difficulties, the many new and complicated problems which he did not doubt the future still had in store for them. It was, therefore, with all the greater pleasure that he was able to tell them that he had agreed to give them the benefit of his services for another year at a considerably reduced fee.

Mr. A. A. Campbell Swinton seconded the motion.

Mr. J. S. Highfield, the advisory engineer, addressed the shareholders as to the prospects of the company. He said the policy of controlled decentralisation was working well, and the managers at each of the stations had done good work during the year. He was confident that the policy of concentrating attention on the earning of profits instead of mere running costs and lamp connections had already had a good effect, and he thought they would see increased results in the future. In spite of a slight rise in coal prices, the costs were reduced. The additions to capital account had been kept as low as possible in spite of the increase in connections of about 3,000 kw., or nearly 9 per cent., and of units generated of 2,091,000, or 12·4 per cent. Owing to bad trade, and a fine summer, and an increase in economical habits, most electrical undertakings had had a bad year, but he was hopeful for the future, although there might be a temporary set-back by decreased consumption, owing to the introduction of wire lamps. The electric motor was now used for many purposes, and their engineers had in most cases made themselves familiar with its use in various industries, and they were making a practice of using their experience gained in one town for use in other towns. The stations were run in a most economical manner. The ratio of expenses to gross expenditure was about 47 to 48 per cent. over the whole of the undertakings. The plant was in very good order, and was being well run, and, as a matter of fact, their main difficulty did not lie in their plant or engineering, but in the business management.

Mr. Page said that, notwithstanding the hopeful speeches of the chairman and Mr. Highfield, he contended that the company was in a very bad way, and was worse than it was last year. The capital expenditure last year had been £52,081, while the increased profit from investments had only been £2,123—just 4 per cent. on the extra expenditure. It was plain to him that the company had made no progress whatever. Many of the subsidiary companies were white elephants, and in his opinion the only hope of ever getting better results was for the directors to turn their attention to private installation work. He would like to see a small committee appointed to confer with the board on that question.

Mr. Swan inquired what fee was being paid to Mr. Highfield, and complained that he should still be retained as expert adviser, seeing that he was only appointed for a year. The Scarborough Tramways Co. was one of their most unfortunate undertakings, of which Mr. Campbell Swinton was the engineer. Upon a capital of £100,000 the gross profits last year were £8.

Mr. Hedges said that as a member of the advisory committee who appointed Mr. Highfield, he was clear that his election was only for 12 months. Mr. Campbell Swinton was, he thought, elected to the board to look after the stations, which work, it appeared, was still being done by Mr. Highfield. Mr. Tuckett had done all the work he promised, but he was afraid that the other directors performed very little service, and his feeling was that they should either do more or else give way to others.

Mr. A. H. Barber said he had attended the meetings for many years, and all they heard was recriminations and hopes for the future, but those hopes never seemed to fructify. Mr. Page was the only man who had made any practical suggestion for increasing their profits, and he would like to see him on the board.

The Chairman, in replying on the discussion, said that in no case had the capital of the subsidiary companies been written down, and it would not be politic on their part to advocate such a course, in view of the relation of the companies with the local authorities. It might be advisable to write down their own capital in two or three years' time when the guarantee of the Urban Co. expired. At the present time it was impossible to do anything in that direction, as they were quite in the dark. With reference to Mr. Highfield's reappointment, he could perhaps give them a most conclusive reason for that, viz., that unless they retained his services for another year they could not retain his (the chairman's) services. He thought it was rather hard upon the present board to criticise them for past action to which they were no party. They had come into these rotten companies, and they were determined to get the company out of the ruck in which it had got. The shareholders were taking up a very unreasonable attitude in attacking the board for not having effected revolutions in the course of one year. They had always told them that it was going to be a very hard and a long job to pull the company round. As illustrating the difficulties they had to contend with, there was the case of Frome. There were only 2,500 rateable buildings in the town, and of those 56 per cent. were cottages rated at less than £8 a year, another 16 per cent. were rated at less than £16, and a similar percentage at under £20 a year. It was impossible to get a profit out of a place like that. There was a possibility of a slight improvement, but they could not hope for any radical improvement in such a place. With regard to the private lighting department, the board were doing all they could to push that business, and had resumed advertising to a moderate extent. The position of the company was better than it was, although the progress was slow. He saw his way to finance the undertaking for several years, and it was not in the parlous state that Mr. Page would seem to imagine.

The report was then adopted.

The Chairman, in proposing the re-election of Mr. Campbell Swinton as a director, said that when first appointed Mr. Swinton only accepted the position at the request of the shareholders. It would certainly not be in the interests of the company that he should retire just as he was getting a grip of its affairs.

Mr. Stanley Berton seconded the re-election.

Mr. Page, as an amendment, moved that a committee of six shareholders be appointed to confer with the board to select a candidate for the vacant directorship.

Mr. Swan seconded the amendment.

Mr. Campbell Swinton said the only reason he accepted a seat on the board was because he was a large shareholder. The remuneration was absolutely ridiculous as compared with the amount of time given to the company.

The amendment was negatived by a large majority, and the resolution was carried.

## Electric Construction Co., Ltd.

The sixteenth annual meeting was held on Thursday of last week at Winchester House, E.C., Mr. W. S. B. McLaren presiding.

The Chairman, in moving the adoption of the report (see Electrical Review, July 9th, page 69), said the accounts showed a marked improvement upon those of last year. Indeed, they had to go back to 1904 (when the last dividend was paid on the ordinary shares) to find net profits comparable with those of the past financial year, and, having regard to the general depression in trade and to the continued strenuous competition in the electrical manufacturing industry, they had every reason to congratulate themselves. As an illustration of what this competition meant, he might mention the case of tenders which were submitted recently for the extension of a provincial electric lighting station. No fewer than 33 firms tendered, and in the aggregate 118 tenders were submitted. These ranged from a minimum of £2,751 to a maximum of £4,218, and while he did not suggest that the whole of the difference was represented by the electrical portion of the plant, still, the figures would give some idea of the competition that prevailed. He must repeat what he said last year, that the electrical manufacturing industry was suffering severely from overproduction. During the present decade about £7,000,000 had been invested in this branch of the business, the greater part whereof was earning no dividend, and they would realise what this had meant to older concerns like their own, for, although there had been a steady and increasing outlet for electrical plant, the power to supply had been grossly in excess of demand, in consequence of the huge increase in capital. If this unsatisfactory state of affairs prevailed in the industry generally, they would naturally expect him to tell them what justification there was for the hope expressed that the enhanced profits now reported would be fully maintained. During the whole period of this depression, the closest attention had been given by the board and the management to economical production; and, further, they had not hesitated to keep their works up to the highest state of efficiency by installing the most modern labour-saving appliances, and the return on this expenditure left not the slightest doubt in the minds of the directors that the money was well spent. This progressive policy had placed them in a position to produce electrical plant of any size or kind at prices which he was confident were second to none, and, while it was always dangerous to prophesy, still, they had every reason to expect that, in the absence of any further slump in trade or serious cutting of prices, they would be able to submit to them next year results as favourable as those now reported. A glance at the accounts would satisfy them that, if they had not been obliged to pay two years' dividend on the preference shares, the ordinary shares might have received 2½ per cent. The directors and the management would continue to spare no effort to place the company again upon a dividend-paying basis, and they therefore asked them once more for a renewal of their confidence. The accounts did not call for any special comments. On the credit side of the profit and loss account, there was an increase of £5,711 on manufacturing and contracting, and sundry receipts. This was due to causes which he had already described, and was the most gratifying feature in the accounts, as it indicated that, notwithstanding the low prices which had prevailed, they could earn a moderate profit upon their products. If a sufficient volume of business could be obtained, he should have no doubt whatever about their being able to distribute a reasonable dividend on the ordinary shares, and an increase in output is the crux of the situation. Whether that increase would be obtained this year, he could not say. Dividends on shares in other companies shows a reduction of £2,339. The Electrical Power Storage Co., Ltd., in which they were largely interested, had suffered from the general depression in trade, and for the first time for a period of 17 years found itself unable to declare a dividend. The directors of that company reported, however, that there were indications of a revival in business, and it was hoped that this improvement would continue and enable the company to resume payment of dividends in the near future. Their holding in the Madras tramways had yielded a somewhat better return. The directors of that company contemplated a further extension of the tramway, and if that was carried out, the return upon their deferred shares would be materially improved. The debit side of the profit and loss account did not call for any lengthened review. General charges showed a reduction of £458, and maintenance of plant and buildings a reduction of £966. The latter saving was not due to short-sighted economy, the premises having been maintained, as hitherto, in thorough condition, and the cost of providing all new loose tools, or the renewal of same, had in accordance with the

company's invariable practice, been debited entirely to revenue. The net profit for the year, after paying £10,350 for debenture interest and crediting £5,000 as formerly to depreciation account, was £10,731 and, after paying a dividend for two years on the preference shares, they would carry forward £3,688 to next year, being an increase of £1,941 on the sum brought in. The profit of £10,731 for the past year compared with £5,932 for 1907-8, and with a loss of £1,442 for 1906-7. The financial position of the company was very satisfactory. They had ample working capital, and were thus able to buy on the most advantageous terms. Indeed, in the opinion of the board, the company's position generally had been greatly improved of recent years and justified them in looking forward to the future with every confidence.

MR. P. E. BEACHCROFT, in seconding the motion, said that they could consider the report as satisfactory, and that in these days of severe competition they, at any rate, showed very good progress. Although the figures did not show extravagant profits, they were evidence, he hoped, of better things to come. The fact that they had been able to hold their own showed that the company had the reputation for turning out the best work in their particular trade. He did not know when he had looked with more confidence to the future as he did that day. There was already signs of an improvement in the bad depression which had existed in the past.

The CHAIRMAN, replying to a shareholder, said that the general reserve was invested in the business, and that £14,858 of invested funds was split up as follows:—£5,000 in 3½ per cent. India Stock, £5,000 3½ per cent. New South Wales Stock, and £5,000 at 4 per cent. on deposit with a very rich company in Yorkshire, and they had £124,000 in other companies. They held all the ordinary shares of the Madras Electric Tramway Co., and £12,000 of the preference shares. They were also shareholders in the Electric Power Storage Co. The shares stood in the books at par, but against that they had a general fund of £285,000. It was no business of the company to hold shares, and he hoped that next year those figures would show a considerable change.

The report was adopted.

## Chatham and District Light Railways Co.

THE directors' report for the half-year ended June 30th, 1909, shows that the receipts were £20,363, and the expenses £12,821, leaving £7,542; less rent of Rochester Corporation lines, £1,872, and interest on debentures, £1,234; leaving £4,437, plus £233 brought forward. Out of the balance the directors recommend the appropriation of £2,940 to dividend at the rate of 5 per cent. per annum on the preference shares, and £1,730 to revenue new account. The traffic receipts show an increase of £1,137 over those for the corresponding period of last year. This, however, is almost entirely accounted for by the fact that the extensions to Strood and Frindsbury were not open for public traffic for the full half-year of 1908. The directors will, as usual, provide for depreciation when the final accounts are made up at the end of the year.

| Half-year ended. | Miles open. | Passengers carried. | Traffic receipts. | Average fare. | Car mileage. | No. of cars. |
|---|---|---|---|---|---|---|
| December, 1908.. | 14·98 | 4,357,745 | £22,282 | 1·22 | 597,363 | 45 |
| June, 1909 .. | 14·98 | 4,028,327 | 19,787 | 1·18 | 561,758 | 45 |

## The General Electric Co., Ltd.

THE annual meeting of this company was held on Monday last at 71, Queen Victoria Street, E.C. In moving the adoption of the report (see ELECTRICAL REVIEW, July 16th, p. 106) the CHAIRMAN (Mr. G. Byng) spoke as follows:—

I beg to submit to you our balance-sheet for the year ending March 31st last. You will be glad to note that we show a larger profit this year than last year. We have written off more for depreciation at our works, and have placed to the credit of our reserve fund a larger sum—over £16,000; the resources of the company and the security of the preference shareholders have thereby been materially strengthened. The margin of such security has more than doubled since the company was incorporated nine years ago—our ordinary shares then amounted to £250,000, whilst to-day these shares, plus the reserve fund, exceed £500,000. I am sorry that in spite of such undoubted security offered, we find our preference shares quoted at a discount; I presume we, in common with others, suffer because Stock Exchange quotations take little heed of intrinsic value, and also because capital is not flowing freely into the best English industrial securities—we reckon ourselves amongst these. We are experiencing this in many other directions, and it is beginning to do much harm to the industries of this country in general, but above all to electrical enterprises. The income from our investments does not vary much; it has resulted in a return of about 10 per cent. The capital increase shown in these investments is represented by shares in foreign companies, established to act as our selling agents—as in France, Spain, South Africa, &c. The pressure of competition at home forces us to seek orders more and more abroad. Unfortunately, Customs duties are against us—not only on account of their stiffness, but also on account of their uncertainty; and it would be of enormous assistance to us if our Government could enter into commercial treaties with Continental nations, or with any other nation, instead of relying upon the so-called "most-favoured-nation" clause—a clause which has often acted against us. We are continually influenced by the tariff fighting of foreign nations amongst themselves. The position of a great country waiting for the outcome of disputes between others is exceedingly ludicrous, and puts us at a disadvantage compared to our foreign competitors. After having spent money in pushing our manufactures, the duties are suddenly raised against us. At present the alterations of Customs duties in France are making us very anxious, and we hope that they will soon be settled, one way or another. Sundry debtors and stocks stand at slightly higher figures on account of the larger turnover. Additions to buildings and plant are smaller; the capacity of our works is greater than the demand. From a purely technical point of view all our works have done well; our engineering staff at Witton has especially distinguished itself. We have installed a larger number of big plants—especially a number of turbine plants; they have proved very successful, and have greatly enhanced the reputation of our Witton electrical engineering works, strengthening their position in the foremost rank of electrical engineering firms. Our carbon works are largely occupied with making flame arc carbons. Ours is the only factory in England where such carbons are made; we have succeeded in competing with Continental firms. For this, great credit is due to the energy and skill of the manager and staff of that factory. All our batteries, porous pots and dry cells are now made at Witton. We have added a large welding plant to our tube works, and our art metal works at Sherlock Street, Birmingham, are making heating stoves and radiators in addition to electric light fittings. We have considerably extended our telephone factory at Peel Works, and I am pleased to record that the telephone equipments produced at these works have been adopted by our own and Colonial Governments, and are considered an advance upon those made by the most prominent manufacturers in America and on the Continent. The sale of Osram lamps has been large, and experience has proved that the marvellous economy and durability claimed for this invention is entirely justified. No invention since the advent of electric lighting has produced an equal effect. It may have somewhat disorganised the supply, but, in the long run, the result will be one of the greatest benefit to the whole industry. The factory at Hammersmith is completed, and is turning these lamps out equal in quality in every respect to those produced on the Continent. The process of teaching workpeople in this new industry is proceeding rapidly, and soon we hope to employ over 1,000 skilled hands. We have had exceptional opportunities of comparing the capacity of our English staff and workmen with that of similar German and American organisations. I am pleased to tell you that Englishmen have learned as quickly and as well as their foreign competitors, and in some respects have surpassed them. This is not a biassed opinion of my own, but the actual experience of the engineer who has taught both here and abroad. Generally speaking, we cannot be dissatisfied with the year's working. Our profits have been assisted by the steady market, and the low prices of metals, besides the absence of any labour troubles. At the same time we must not forget that our profits, while they may compare favourably with those of other English concerns, do not come up to the standard of profits obtained by foreign electrical companies working under similar conditions. The foundations of our company are good, and also, I believe, its management; but we suffer, as almost everybody does, from a general trade depression. The conditions of the country and the outlook are, to my mind, far from bright, and it would be wrong for business men to overlook the present symptoms. We have mainly felt them in our efforts to fill our works with sufficient orders so that they can be run at their full working capacity. We have seven large factories, and everyone of them could give an increased output without any material increase of capital or of general expense beyond the payment of more wages. Running at less than full capacity means loss, not only in money, but in upkeep, and in the spirit and skill of both masters and men. We have been compelled in some instances to reduce hands, and to run short hours. That means machinery and buildings idle, managers and workpeole idle. This is waste to our company, and waste to the nation. If that waste could be turned into work, such work would be obtained for nothing. That is the way to get things for nothing. Unfortunately people do not see it. It is simply a question of demand. If that demand did not exist, it could not be helped, but it does exist at our very doors. There is plenty of electrical work to be got if we only keep it in this country, and do not send it abroad. Unfortunately, instead of its being directed into our factories, our national policy deliberately directs it into foreign factories. The working of a large commercial concern like ours shows clearly the effect of Free Trade. I am sure that our own experience is the experience of almost every factory in the country at the present moment. We are all being worked below our productive capacity. If you were to go into any English factory, you would receive in nine out of every ten the same answer, "We could do more work with our existing plant." What holds good of industry, holds good of agriculture—under-production rules in field, farm and factory. It is incredible, but a fact as you know, that in spite of this state of affairs we are importing over £200,000,000 of manufactures and agricultural produce every year, every pound's worth of which could be produced here, simply by employing our natural produce, and our brains and sinews, now retrograding in idleness. We are met with the contention that we import all this because it is cheaper. What can be cheaper than getting things for nothing by turning waste into work? That is really the question if gentlemen will only understand it. I say here 200 millions, but it is my firm opinion it is nearer 300 millions every year. It is plain as a pike staff, yet people won't see it. You know that I think all this could easily be accomplished. A budget could be framed which would raise the production of the nation to its full capacity—let Mr. Lloyd George know that—and

the objection I have to the budget now proposed is that it does nothing to encourage production at home. On the contrary, it does everything to discourage us by heaping further taxes and expenses upon the producer, and by leaving untaxed the foreign importer who competes with us in our own markets. As an employer representing labour, I protest against this budget. It is futile, and would defeat its own ends after, I believe, causing a great deal of suffering, because it ignores the foremost function of Government—to preserve the wealth of the nation by fostering the productive capacity of its people.

MR. HUGO HIRST seconded the adoption of the report, and it was carried without comment. The resolution declaring a dividend of 5 per cent. per annum was also approved.

MR. HIRST then proposed the re-election of Mr. E. G. Byng, and gladly took the opportunity of testifying to the great active interest he had taken in the firm, and his use to the management. He was looking forward to his co-operation. This was carried, and the auditors were also re-elected.

MR. WOOD, a shareholder, moved a vote of thanks to the chairman, remarking that he had come to the meeting of a commercial undertaking and had listened to a semi-political address.

The members of the staff then went back to their various departments, and the representatives of the Press disbanded.

## City and South London Railway Co.

THE directors' report for the half-year ending June 30th, 1909, states that the receipts from all sources have amounted to £89,563, and the cost of working has been £39,975, leaving a profit of £49,588. Inclusive of the balance brought forward, the net revenue account shows an aggregate total of £50,542. After making provision for the debenture stock interest, rent charge, and the transfer to the renewal fund of £1,500, a balance remains available for dividend of £34,663. Out of this sum the directors recommend that the full dividend of 5 per cent. per annum be paid on the preference stocks, 1891, 1896, 1901 and 1903, and that a dividend at the rate of 1¾ per cent. per annum be paid upon the consolidated ordinary stock for the half-year, leaving a balance of £1,412 to be carried forward.

| Half-year. | Passengers (exclusive of sson. tckt. hldrs.). | Receipts (including sson. tckts.). | Div. per cent. per ann. on ordinary. |
|---|---|---|---|
| December 31st, 1906 .. | 9,164,293 | £72,228 | 2 |
| June 30th, 1907 .. .. | 10,048,780 | 77,520 | 2¼ |
| December 31st, 1907 .. | 10,732,145 | 83,452 | 1¾ |
| June 30th, 1908 .. .. | 10,891,585 | 83,475 | 1¾ |
| December 31st, 1908 .. | 10,631,336 | 81 260 | 1¾ |
| June 30th, 1909 .. .. | 11,227,179 | 84,248 | 1¾ |
| Total since opening line | 228,659,576 | £1,772,157 | |

The directors are glad to be able to point to an increase in the receipts from all sources during the half-year. This result is the more satisfactory in view of the constantly progressing electrification of tramways which connect with and feed those already competing with this company's line. It has also to be remembered that as 1908 was leap year, the half-year now under review was shorter by one day than the corresponding period.

In their Bill of this session the Central London Railway Co. are applying to Parliament for powers to construct a subway connecting the high-level public subways of their Bank Station with the booking hall of this company's station at the Bank, thus furnishing additional access between the two companies' stations and also direct communication with the Waterloo and City Railway. Subject to this power being obtained, an agreement has been entered into for the construction of the subway at the joint expense of the two companies. The St. Swithin's Lane portion of the proposed subway has been withdrawn from the Bill.

## Crompton & Co., Ltd.

THE directors' report up to March 31st last shows that the depression in trade in almost all parts of the world in which the company does business, and the resulting keen competition, has rendered the obtaining of remunerative orders during the financial year a matter of very great difficulty, and a certain amount of work has had to be undertaken at a very small margin over cost. The net profit for the year amounts to £10,051 (as compared to £31 310 for the year ending March 31st, 1908). After providing for debenture interest, and other charges shown in the net revenue account, there remains, with the sum brought forward from last year, an available balance of £7,828. The directors propose out of this sum to set aside £1,500 for doubtful debts and contingencies, and to carry the balance forward. The number of additional lamps connected to the mains of the Electric Supply Corporation undertakings during the year ending December 31st last represents an increase of approximately 20 per cent., which is satisfactory. The guarantee as to the earnings of the Electric Supply Corporation, which expires in December next, will not, so far as the directors can foresee, necessitate any further increase in the company's interest in the guaranteeing company. The dullness of trade still continues, although there are some indications of improvement. The directors have in view some important orders which it is hoped will be secured at satisfactory prices; they also have pleasure in reporting that during the financial year a patent has been obtained for a new auto converter, invented at the company's works. Orders for these machines are now being executed, and it is anticipated that the invention, for which there is a large field, will prove of considerable importance to the company's business. With a view to obtaining fresh capital until such time as the company can profitably reduce its holdings in other concerns, an offer of short-term notes was made to the shareholders in February last. The directors are now offering elsewhere the balance unapplied for. In order to prevent the possibility of delay in the issue of the company's annual accounts, it is proposed, in future, to close the accounts of the company's foreign branches at December 31st in each year, instead of at March 31st, as at present. This course has the approval of the company's auditors.

## Madras Electric Supply Corporation, Ltd.

THE directors' report for the year ended December 31st, 1908, expresses regret that the contractors have not yet completed their work, although it was anticipated that everything on the direct-current side would have been finished by February, 1908, and on the alternating-current side for the tramway supply by January 1st last. The buildings and equipment of the main generating station, the sub-station at Mylapore and the tramway sub-station, are now, however, practically finished. The construction of the main generating station had been so far completed on April 3rd last that the company commenced the supply of electricity to the public from the permanent plant, and it is hoped shortly to supply current to the Tramways Company, who have entered into a contract to purchase a minimum of one million units per annum. Agreements for the supply to the Port Trust and to the Government Buildings have been drafted and are now being considered. The grant of the new licences for the supply of current to Fort St. George and to the Port Trust is expected shortly. In anticipation that there would be a large demand for electric fans, to take the place of punkahs, which are used for the whole year in Madras, the directors sent out a considerable number to sell or hire out to consumers. Each fan installed will be a useful addition to the demand for current. The temporary oil-engine plant is now being dismantled, and although the working on this small scale was not expected to be profitable, the Board feel that the expenditure constituted a useful advertisement. The supply to the public commenced with an equivalent of 5,200 8-C.P. lamps connected to the mains. Many applications from other consumers have since been received, and some are already connected. Full particulars will, of course, be furnished in the report next year, but the directors think it right to state that they are quite satisfied with the prospects of the company. With reference to the company's investment in 4½ per cent. preferred ordinary shares in the Madras Electric Tramways (1904), Ltd., it is satisfactory to note that the tramways are doing well, and this company has recently received a dividend at the rate of 5 per cent. per annum (including ½ per cent. out of surplus profits) on these shares.

## Direct United States Cable Co., Ltd.

THE directors' report for the half-year ended June 30th, 1909, shows that the half-year's revenue, after deducting out-payments, amounted to £56,445 as compared with £51,368 for the corresponding period of 1908, showing a difference of £5,077 in favour of the half-year under review. The working and other expenses for the same period, including income tax, amounted to £25,036, leaving a balance of £31,409 as the net profit, making with £4,506 brought forward a total of £35,915. For the corresponding period of 1908, the working expenses and other payments amounted to £24,932. Three quarterly interim dividends of 4s. each per share, amounting to £36,426, have been declared and paid during the financial year, and a final dividend of 4s. per share is now proposed, together with a bonus of 1s. per share (both free of income tax), making with the three interim dividends 4¼ per cent. for the year, being a total distribution of £51,603. After transferring £5,000 to the reserve fund account, the balance of £3,596 on the revenue account is proposed to be carried forward. The reserve fund account has been debited with £13,857 for the cost of cable maintenance, and after being credited with interest on the investments, profit on sale of securities, and amount transferred from revenue, the balance now amounts to £510,267.

**France.**—The report of the Société de l'Energie Electrique du Nord de la France for the last financial year shows a gross profit of £11,368; the bulk of this has been applied to depreciation, leaving a balance of £790 to be carried forward. The plant at present in operation comprises two 1,750-KW. turbines and dynamos, and two 3,500-KW. sets. Plans are now being prepared in respect of a new 5 000 KW. set. By the end of the present year the company will, it is expected, have an output equal to 1,900,000 KW.-hours per month.

At the annual meeting of the Compagnie Internationale des Lampes Electriques Zircon Wolfram, lately held in Paris, a dividend of 8½ fr. per share was declared. It was stated that the prospects of the company were very bright, all the subsidiary concerns being busily occupied.

**St. James' and Pall Mall Electric Light Co., Ltd.**—The directors have declared an interim dividend on the preference shares at the rate of 7 per cent. per annum, and on the ordinary shares at the rate of 10 per cent. per annum, for the half-year ending June 30th. The share transfer books will be closed from July 24th to August 0th, inclusive.

## MARKET QUOTATIONS.

**Wednesday, July 21st.**

| CHEMICALS, &c. | | Latest Price. | Fortnight's Inc. or Dec. |
|---|---|---|---|
| a Acid, Hydrochloric .. .. | per cwt. | 5/- | .. |
| a „ Nitric .. .. .. .. | „ | 22/- | .. |
| a „ Oxalic .. .. .. .. | „ | 28/- | .. |
| a „ Sulphuric .. .. .. | „ | 5/6 | .. |
| a Ammoniac, Sal .. .. .. | „ | 42/- | .. |
| a Ammonia, Muriate (crystal) .. | per ton | £29 | .. |
| a „ „ .. .. | „ | £30 | .. |
| a Bleaching powder .. .. .. | „ | £5 10 | .. |
| a Bisulphide of Carbon .. .. | „ | £18 | .. |
| a Borax .. .. .. .. .. | „ | £16 | .. |
| a Copper Sulphate .. .. .. | „ | £18 10 | £1 dec. |
| a Lead, Nitrate .. .. .. | „ | £25 10 | .. |
| a „ White Sugar .. .. .. | „ | £23 10 | .. |
| a „ Peroxide .. .. .. | „ | £32 | .. |
| a Methylated Spirit .. .. .. | per gal. | 2/6 | .. |
| a Potassium, Bichromate, in casks | per lb. | 8½d. | .. |
| a Potash, Caustic (75/80 %) .. | per ton | £20 | .. |
| a „ Chlorate .. .. .. | per lb. | 3½d. | .. |
| a „ Perchlorate .. .. .. | „ | 5⅝d. | .. |
| a Potassium, Cyanide .. .. .. | „ | 7d. | .. |
| a Shellac .. .. .. .. | per cwt. | 70/- | .. |
| a Sulphate of Magnesia .. .. | per ton | £4 10 | .. |
| a Sulphur, Sublimed Flowers .. | „ | £6 10 | .. |
| a „ Recovered .. .. | „ | £5 10 | .. |
| a „ Lump .. .. .. | „ | £5 | .. |
| a Soda, Caustic (white 70 %) .. | „ | £10 15 | .. |
| a „ Chlorate .. .. .. | per lb. | 3⅜d. | .. |
| a „ Crystals .. .. .. | per ton | £3 5 | .. |
| a Sodium Bichromate, casks .. | per lb. | 3d. | .. |
| a „ Cyanide (basis 100 %) .. | „ | 7d. | .. |
| **METALS, &c.** | | | |
| b Aluminium Ingots, in ton lots .. | per ton | £70 | .. |
| b „ Wire, in ton lots .. | „ | £112 | .. |
| b „ Sheet, in ton lots .. | „ | £120 | .. |
| p Babbitt's metal ingots .. .. | „ | £50 to £135 | .. |
| c Brass (rolled metal 2" to 12" basis) | per lb. | 7½d. | .. |
| c „ Tube (brazed) .. .. | „ | 8¼d. | .. |
| c „ „ (solid drawn) .. .. | „ | 7½d. | .. |
| c „ Wire, basis .. .. .. | „ | 6⅝d. | .. |
| c Copper Tubes (brazed) .. .. | „ | 8⅝d. | .. |
| c „ „ (solid drawn .. .. | „ | 8⅜d. | .. |
| g „ Bars (best selected) .. | per ton | £70 | £3 dec. |
| g „ Sheet .. .. .. | „ | £70 | £3 dec. |
| g „ Rod .. .. .. .. | „ | £70 | £3 dec. |
| e „ (Electrolytic) Bars .. | „ | £60 5 | 10/- dec. |
| e „ „ Sheets .. | „ | £77 | 5/- dec. |
| e „ „ Rod .. | „ | £65 | 5/- dec. |
| e „ „ H.C. Wire | per lb. | 7¼d. | ⅛d. dec. |
| f Ebonite Rod .. .. .. | „ | 8/8 | .. |
| f „ Sheet .. .. .. | „ | 9/- | .. |
| n German Silver Wire .. .. | „ | 1/6 | .. |
| h Gutta-percha, fine .. .. .. | „ | .. | .. |
| h India-rubber, Para fine .. .. | „ | 7/10 | 1/4 inc. |
| l Iron Pig (Cleveland warrants) .. | per ton | 48/4 | 2d. inc. |
| l „ Wire, galv. No. 8, P.O. qual. | „ | £14 | .. |
| g Lead, English Ingot .. .. | „ | £13 to £13 2 6 | 2/6 dec. |
| m Manganin Wire No. 28 .. .. | per lb. | 8/- | .. |
| c Mercury .. .. .. .. | per bot. | £8 5 | .. |
| d Mica (in original cases) small .. | per lb. | 6d. to 1s. | .. |
| d „ „ „ medium | „ | 2/6 to 4/- | .. |
| d „ „ „ large .. | „ | 4/6 to 8/6 | .. |
| p Phosphor Bronze, plain castings | „ | 1/- to 1/1 | .. |
| p „ „ rolled bars & rods | „ | 1/1½ to 1/3 | .. |
| p „ „ rolled strip & sheet | „ | 1/2½ to 1/6 | .. |
| o Platinum .. .. .. .. | per oz. | 91/6 | variable. |
| e Silicium Bronze Wire .. .. | per lb. | 9½d. | .. |
| r Steel Magnet, in bars .. .. | per ton | £55 | .. |
| g Tin, Block (English) .. .. | „ | £130 to £131 | £1 inc. |
| n „ Wire, Nos. 1 to 16 .. | per lb. | 1/8½ | .. |
| p White Anti-friction Metals:— | | | |
| "White Ant" brand .. .. | per ton | £35 to £60 | .. |
| k Zinc, Sh't (Vielle Montagne brd.) | „ | £25 10 | .. |

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

**Stock Exchange Notices.**—The Committee has appointed a special settling day as under:—

Thursday, August 5th.—British Aluminium Co., Ltd.—Further issue of 89,070 ordinary shares of £5 each, fully paid, Nos. 60,001 to 99,070; and 89,070 7 per cent. cumulative preference shares of £5 each, fully paid, Nos. 60,001 to 99,070.

Application has been made to the Committee to allow the following securities to be quoted in the Official List:—

Hurst, Nelson & Co., Ltd.—20,000 6 per cent. cumulative preference shares of £10 each, fully paid, Nos. 1 to 20,000.

**Anglo-American Telegraph Co., Ltd.**—After placing £5,000 to the credit of the renewal fund, the directors have declared an interim dividend for the quarter ending June 30th, 1909, of 15s. per cent. on the ordinary stock, and £1 10s. per cent. on the preferred stock, less income tax, payable on July 31st. The balance of £24,414 is to be carried forward.

**British Columbia Electric Railway Co.**—On July 31st, a dividend at the rate of 5 per cent. per annum will be paid on the 5 per cent. non-cumulative preferred ordinary stock for the half-year ended June 30th, together with an additional dividend at the rate of 1 per cent. per annum for the same period.

## STOCKS AND SHARES.

Tuesday Afternoon.

Markets remain in the condition of stagnation incidental to this period of the year. In the electrical sections there is little going on, and less to write about. With this bid for the enlistment of sympathy from the reader, the placid tale may be permitted to unroll its paragraphic fold's.

The Railway dividends are beginning to make their appearance and (the Metropolitan Railway has declared 1 per cent. on the Ordinary and 2½ per cent. on the Surplus Lands stocks. Some of the more eager bulls talked of the dividend being probably 1¼ per cent. on the Ordinary stock, and the price fell from 41⅜ to 40¼, the latter still showing a rise on the week. The announcement encourages the hope expressed here some months ago that the initial troubles of electrification are over, and the line is at last on the way towards reaping the reward of its change of system. Districts at 17⅜ show no alteration.

East London proprietors are disappointed at the failure of the directors to grapple with the problem of electrification, and the report which came out last Saturday attributes the delay to the board's intention to await results achieved by the London, Brighton and South Coast Railway over its electrified South London section, which, of course, is not yet open for traffic. East London Ordinary keeps about 3⅜, and the junior debenture stocks remain at 22½, 8 and 5 for the "B," "C" and "D" issues respectively.

City and South London Ordinary has risen to 32 upon the issue of a satisfactory report, following upon the increased dividend noticed here last week. The Central London trio continue at their depressed levels, pending the dividend statement.

Quite a storm in a teacup has arisen over the way in which the County of London Electric Supply Company has called up the amounts due on allotment of the new debenture stocks. To save the company a little future trouble hereafter, the first instalment has been called up so as to include the shillings and pence that would have become due on the future payments. This, of course, complicated Stock Exchange dealings rather badly, and the dealers are very indignant about it. Nominally the premium is 3 for the First Debenture, and 2½ for the Second.

The St. James' and Pall Mall Electric Supply Company has declared a dividend at the rate of 10 per cent. on its Ordinary shares, which is the same as usual, and the price has not moved. There is a faint demand for Edmundson's and Urban issues. Edison and Swan were marked back to 5s. middle, and can be bought at a few pence above this price. Crompton's are flat on the issue of a disappointing report. The Calcutta Electric Supply Company has offered its new issue of Preference shares, but at the time of writing it is not possible to give any idea as to what kind of response has been received from the public. Victoria Falls Preference are a trifle harder upon the statement that the company has accepted the offer of a substantial bonus to expedite delivery of current to one of its mining company customers.

Canadian General Electric has risen to 121, and Mexican Light and Power Common is up to 71, the group as a whole being decidedly better. Nevertheless, there seems an uneasy feeling lest the damage on the dam of the Mexican Light and Power property may turn out to be more costly than even the £40,000 at present estimated. Rio Trams are 90, and Sao Paulo 150½.

Good buying of Anglo-American Telegraph Deferred has hoisted the price to 17, the quarterly statement out a few days back being the inspiration for the rise. The figures are satisfactory enough, but to touch the Deferred stock is to embark upon a lively gamble. Other telegraph issues have been almost stationary. National Telephones are good, both the Preferred and Deferred stocks showing rises.

British Electric Traction Ordinary were done at 10s. on Monday, and the Preference slipped back another 2s. 6d., to 2½. British Columbia Preferred stock is rather better. A little business is being done in London United Tramways issues. London General Omnibus stock has slumped to 20. A movement is on foot to induce shareholders of the Electrobus Company to support an agitation, but perhaps the unfortunate shareholders will be best advised to let ill alone in this instance. A noticeable advance amongst the Miscellaneous divisions is one of 3 points in Electric Construction Debenture stock.

**Metropolitan Railway Co.**—The directors recommend a dividend upon the ordinary stock for the past half-year at the rate of 1 per cent. per annum, (against ½ per cent. at this time last year), carrying forward about £4,000. Dividends on the surplus lands stock will be at the rate of 2½ per cent. per annum, carrying forward about £1,000.

# SHARE LIST OF ELECTRICAL COMPANIES.

## TELEGRAPH AND TELEPHONE COMPANIES.

| Present Issue. | NAME. | Stock or Share. * | Dividends for the last four years. 1905. | 1906. | 1907. | 1908. | Closing Quotations July 13th. | Closing Quotations July 20th. | Business done week ended July 20th, 1909. Highest | Lowest. | Rise + or Fall − | Present Yield per cent. £ s. d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25,000 | Amazon Telegraph Co.'s shares, Nos. 1 to 25,000 | 10 | Nil | Nil | Nil | Nil | 2⅞ — 3⅛ | 2⅞ — 3⅛ | .. | .. | .. | Nil. |
| 186,700 | Do. do. 5 % Debs., Nos. 1 to 1,250 Red. | 100 | 5 % | 5 % | 5 % | 5 % | 92 — 96 | 92 — 96 | .. | .. | .. | 5 4 2 |
| $131,551,400 | American Telephone & Telegraph, Cap. Stock .. | $100 | 7½ % | 8 % | 8 % | 8 % | 143¾ —144½ | 143½ —144½ | .. | .. | .. | 5 10 9 |
| $58,000,000 | Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000 | $1000 | 4 % | 4 % | 4 % | 4 % | 97 — 99 | 97 — 99 | .. | .. | .. | 4 0 10 |
| 558,460 | Anglo-American Telegraph .. .. .. .. | Stock | 3½% | 3½% | 3½% | £3 4s. | 57 — 59 | 58 — 60 | .. | .. | +1 | 5 6 1 |
| 3,220,770 | Do. do. do. 6 % Pref. .. .. | Stock | 6 % | 6 % | 6 % | 6 % | 100½ —101½ | 101½ —102½ | 102½ | 100½ | +1 | 5 17 1 |
| 3,220,770 | Do. do. do. Deferred .. .. | Stock | 1½ | 1½ | 1 % | 8/- | 16 — 16½ | 16½ — 17 | 17 1/16 | 15⅝ | + ⅛ | 2 4 0 |
| 47,725 | Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red. | 100 | 5 % | 5 % | 5 % | 5 % | 102 —104 | 102½ —104½ | .. | .. | + ½ | 4 16 2 |
| 44,000 | Chili Telephone, Nos. 1 to 44,000 .. .. .. | 5 | 8 % | 8 % | 8 % | .. | 8 — 8⅜ | 8 — 8⅜ | .. | .. | .. | 4 15 6 |
| 2,431,350 | Commercial Cable, Stlng. 500 year 4% Deb. Stk. Red. | Stock | 4 % | 4 % | 4 % | 4 % | 89 — 91 | 89 — 91 | 89⅞ | .. | .. | 4 7 11 |
| 16,000 | Cuba Telegraph .. .. .. .. .. .. | 10 | 5 % | 5 % | 6 % | 6 % | 8⅛ — 8⅞ | 8⅛ — 8⅞ | 8 1/16 | 17½ | .. | 6 15 6 |
| 6,000 | Do. 10 % Pref. .. .. .. .. .. | 10 | 10 % | 10 % | 10 % | 10 % | 17 — 18 | 17 — 18 | 17⅛ | .. | .. | 5 11 1 |
| 12,981 | Direct Spanish Telegraph, Ord. .. .. .. | 5 | 4 % | 4 % | 4 % | 4 % | 2⅞ — 3⅛ | 2⅞ — 3⅛ | .. | .. | .. | 5 8 8 |
| 6,000 | Do. do. 10 % Cum. Pref. .. | 5 | 10 % | 10 % | 10 % | 10 % | 8⅛ — 8⅝ | 8¼ — 8⅝ | .. | .. | .. | 5 12 8 |
| 80,000 | Do. do. 4½ % Debs. .. .. | 50 | 4½% | 4½% | 4½% | 4½% | 99 —101 | 99 — 101 | .. | .. | .. | 4 16 8 |
| 60,710 | Direct United States Cable .. .. .. .. | 20 | 4½% | 4½% | 4½% | 4½% | 12⅜ — 13½ | 12⅜ — 13½ | 13 | 12 1/16 | .. | 6 8 5 |
| 43,500 | Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R. | 100 | 4½% | 4½% | 4½% | 4½% | 99 —101 | 99 —101 | .. | .. | .. | 4 9 1 |
| 4,000,000 | Eastern Telegraph, Ord. Stock.. .. .. .. | Stock | 7 % | 7 % | 7 % | 7 % | 127 —130 | 125 —128 xd | 126⅜ | 125 | .. | 5 7 8 |
| 2,000,000 | Do. 3½ % Pref. Stock.. .. .. | 100 | 3½% | 3½% | 3½% | 3½% | 85½ — 87½ | 84½ — 86½ xd | 85¼ | 85 | .. | 4 0 0 |
| 1,896,706 | Do. 4 % Mort. Deb. Stock. Red. .. | Stock | 4 % | 4 % | 4 % | 4 % | 104½ —106½ | 104½ —106½ | 106 | 105 | .. | 3 15 2 |
| 800,000 | Eastern Extension, Australasia, and China Tele | 10 | 7 % | 7 % | 7 % | 7 % | 11½ — 12 | 11⅛ — 11⅝ | 11 1/16 | 11¼ | — ⅛ | 5 19 2 |
| 752,400 | Do. 4 % Deb. Stock .. .. .. | Stock | 4 % | 4 % | 4 % | 4 % | 102¼ —104½ | 103½ —105½ | 104¼ | .. | +1⅛ | 5 15 11 |
| 200,000 | East. & S. Afric. Tel., 4 % Mt Db. Mauritius Sub.) 1 to 8,000 | 25 | 4 % | 4 % | 4 % | 4 % | 100 —102 | 100 —102 | .. | .. | .. | 8 18 5 |
| 181,127 | Globe Telegraph and Trust .. .. .. .. | 10 | 5½% | 5½% | 5½% | 5½% | 10½ — 10⅝ | 10½ — 10⅝ | 10⅝ | 10½ | .. | 5 7 0 |
| 181,127 | Do. do. 6 % Pref... .. .. .. | 10 | 6 % | 6 % | 6 % | 6 % | 13½ — 13⅝ | 13½ — 13⅝ | 13¼ | .. | .. | 4 7 8 |
| 150,000 | Great Northern Telegraph, of Copenhagen.. .. | 10 | 24% | 20 % | 20 % | 18 % | 25¼ — 26¼ | 25¼ — 26¼ | 25¼ | .. | .. | 6 17 2 |
| 10,000 | Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red. | 100 | 4½% | 4½% | 4½% | 4½% | 99 —101 | 99 —101 | .. | .. | .. | 4 9 1 |
| 17,000 | Indo-European Telegraph .. .. .. .. | 25 | 12 % | 13 % | 13 % | 13 % | 51½ — 53½ | 51½ — 53½ | 52⅜ | .. | .. | 6 1 6 |
| $41,380,400 | Mackay Companies Common .. .. .. .. | $100 | 2 % | 3½ % | 4 % | 4 % | 80 — 84 | 80 — 84 | .. | .. | .. | 4 15 3 |
| $50,000,000 | Do. do. 4% Cum. Pref. .. .. .. | $100 | 4 % | 4 % | 4 % | 4 % | 74 — 79 | 74 — 79 | .. | .. | .. | 5 5 3 |
| 894,190 | Marconi's Wireless Telegraph .. .. .. .. | 1 | Nil | Nil | Nil | .. | ⅜ — ⅜ | ⅜ — ⅜ | 15/9 | 15/7½ | — 3/9 | Nil |
| 72,680 | Monte Video Telephone Co., Ltd. Ord. .. .. | 1 | 5 % | 6 % | 6 % | 6 % | ¾ — 1 | ¾ — 1 | .. | .. | .. | 6 0 0 |
| 86,492 | Do. do. do. 5 % Pref. .. .. | 1 | 5 % | 5 % | 5 % | 5 % | 1⅛ — 1⅜ | 1⅛ — 1⅜ | .. | .. | .. | 5 12 11 |
| 2,295,000 | National Telephone, Pref. Stock .. .. .. | 100 | 6 % | 6 % | 6 % | 6 % | 108 - 109½ | 108½ —110 | 109½ | 108¼ | + ¼ | 5 9 1 |
| 3,725,000 | Do. do. Def. Stock .. .. .. | 100 | 5 % | 5 % | 6 % | 6 % | 124 —126 | 125½ —127½ | 126⅜ | 125 | +1½ | 4 14 1 |
| 15,000 | Do. do. 6 % Cum. 1st. Pref. .. .. | 10 | 6 % | 6 % | 6 % | 6 % | 10½ — 11 | 10½ — 11 | 10⅝ | .. | .. | 5 9 1 |
| 15,000 | Do. do. 6 % Cum. 2nd Pref. .. .. | 10 | 6 % | 6 % | 6 % | 6 % | 10½ — 11 | 10½ — 11 | .. | .. | .. | 5 9 1 |
| 250,000 | Do. do. 5 % Non-cum. 3rd P., 1 to 250,000 | 5 | 5 % | 5 % | 5 % | 5 % | 5⅛ — 5⅛ | 5⅛ — 5⅛ | 5 5/16 | 5 3/16 | + 1/16 | 4 5 1 |
| 9,000,000 | Do. do. 5% Deb. Stock Red. .. .. | Stock | 3½% | 3½% | 3½% | 3½% | 97 — 99 | 97 — 99 | 98 | .. | .. | 3 12 2 |
| 1,983,593 | Do. do. 4 % Deb. Stock Red. .. .. | 100 | 4 % | 4 % | 4 % | 4 % | 99 —101 | 99 —101 | 99⅝ | 99½ | .. | 3 19 3 |
| 179,313 | Oriental Telep. and Elec. 1 to 171,504, fully paid .. | 1 | 7 % | 7 % | 8 % | 8 % | 1 5/16 — 1 7/16 | 1 5/16 — 1 7/16 | 26/6 | .. | .. | 5 6 8 |
| 50,000 | Do. do. do. 6 % Cum. Pref... .. | 1 | 6 % | 6 % | 6 % | 6 % | 1 7/16 — 1 7/8 | 1 7/16 — 1½ | 20/7½ | .. | — 1/16 | 5 8 0 |
| 99,100 | Do. do. do. 4 % Red. Deb. Stock .. | 100 | 4 % | 4 % | 4 % | 4 % | 86 — 88 | 85 — 87 | 85½ | .. | — 1 | 4 12 0 |
| 99,400 | Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000 | 10 | 4 % | 4 % | 4 % | 4 % | 99 —101 | 99 - 101 | .. | .. | .. | 3 19 3 |
| 11,889 | Reuter's .. .. .. .. .. .. .. | 8 | 5 % | 5 % | 5 % | 5 % | 7⅞ — 8⅛ | 7⅞ — 8⅛ | .. | .. | .. | 4 18 9 |
| 145,955 | Telephone Co. of Egypt, 4½ % Deb. Red. .. .. | 100 | 4½% | 4½% | 4½% | 4½% | 98½ —100½ | 98¾ —100½ | .. | .. | .. | 4 9 7 |
| 3,042 | Submarine Cables Trust .. .. .. .. .. | Cert. | 6 % | 6 % | 6 % | 6 % | 129 —132 | 129 —132 | 130 | .. | .. | 4 10 11 |
| 120,000 | United River Plate Telephone .. .. .. .. | 5 | 8 % | 8 % | 8 % | .. | 6⅞ — 7⅛ | 6¾ — 7⅛ | 7⅛ | 7 1/16 | .. | 5 12 8 |
| 40,000 | Do. 5 % Cum. Pref., Nos. 1 to 40,000 .. | 5 | 5 % | 5 % | 5 % | 5 % | 5 — 5⅛ | 5 — 5⅛ | 5⅛ | 5 1/16 | .. | 4 18 0 |
| 80,008 | W. Coast of America, 1 to 80,000 & 53,001 to 53,008 | 2½ | Nil | 2½% | 2½% | .. | 1⅛ — 1⅜ | 1⅛ — 1⅜ | .. | .. | .. | 4 10 11 |
| 150,000 | Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel. | 100 | 4 % | 4 % | 4 % | 4 % | 99 —101 | 99 —101 | .. | .. | .. | 3 19 3 |
| 207,980 | Western Telegraph, Ltd., Nos. 1 to 207,980.. .. | 10 | 7 % | 7 % | 7 % | .. | 13½ — 14 | 13⅝ — 14 | 13 13/16 | 13 7/16 | .. | 5 0 0 |
| 800,000 | Do. do. 4 % Deb. Stock Red. .. | 100 | 4 % | 4 % | 4 % | 4 % | 101 —103 | 101½ —103½ | 101½ | .. | + ⅛ | 3 17 8 |
| 88,321 | West India and Panama Telegraph .. .. .. | 10 | Nil | Nil | Nil | Nil | ⅜ — ⅝ | ⅜ — ⅝ | .. | .. | .. | Nil |
| 84,568 | Do. do. 6 % Cum. 1st Pref. .. .. | 10 | 5 % | 8 % | 6 % | 6 % | 8¼ — 8½ | 8¼ — 8½ | .. | .. | .. | 6 17 2 |
| 4,669 | Do. do. 6 % Cum. 2nd Pref. .. .. | 10 | Nil | Nil | £2 6 | 15 % | 8 — 9 | 8 — 9 | .. | .. | .. | 17 2 4 |
| 80,000 | Do. do. 5 % Debs., Nos. 1 to 1,800 .. | 100 | 5 % | 5 % | 5 % | 5 % | 100½ —102½ | 100½ —102½ | .. | .. | .. | 4 17 7 |

## ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 320,000 | Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007 | 5 | 8 % | 8 % | 9 % | 10 % | 9 3/16 — 9 7/16 | 9 3/16 — 9 7/16 | 9⅜ | 9 7/32 | .. | 9 6 1 |
| 978,230 | Do. 4 % Deb. Stock .. .. .. | .. | .. | .. | .. | .. | 91 — 92 | 9 3/8 - 91⅜ | 91⅛ | 90¼ | — ⅛ | 4 6 6 |
| 332,367 | Auckland E. Trams, 5 % 1st Mort. Deb. Stock .. | 100 | 5 % | 5 % | 5 % | 5 % | 101 —103 | 101 —103 | .. | .. | .. | 4 17 1 |
| 580,000 | Babcock & Wilcox, 1 to 580,000.. .. .. .. | 1 | 20 % | 20 % | 20 % | 20 % | 4⅛ — 4⅜ | 4⅛ — 4⅜ | 87/6 | 8 /8 | .. | 4 11 1 |
| 100,000 | Do. do. 6 % Cum. Pref., 1 to 100,000 .. | 1 | 6 % | 6 % | 6 % | 6 % | 1⅜ — 1½ | 1⅜ — 1½ | .. | .. | .. | 4 0 0 |
| 60,000 | British Aluminium, Ord., 1 to 40,000 .. .. | 5 | 7 % | 7 % | 7 % | 7 % | ⅜ — ⅜ | ⅜ — ⅜ | .. | .. | .. | 6 0 0 |
| 60,000 | Do. do. 7 % Cum. Pref. .. .. .. | 5 | 7 % | 7 % | 7 % | 7 % | 1 — 1⅛ | 1⅛ — 1⅜ | 30/- | .. | + ⅛ | 4 2 1 |
| 40,100 | Do. do. "A" 6 % Cum. Pref. .. .. | 5 | 6 % | 6 % | 6 % | 6 % | 2½ — 3½ | 3 — 3½ | .. | .. | + ½ | 8 11 5 |
| 12,897 | Do. do. 4 % Funding Certs. .. .. | 5 | 4 % | 4 % | 4 % | 4 % | 2½ — 3½ | 2⅝ — 3½ | .. | .. | .. | 5 14 3 |
| 124,400 | Do. do. 5½ % Loch Leven Debs. .. | 100 | .. | 5½% | 5½% | 5½% | 94 — 99 | 94 — 99 | .. | .. | .. | 5 11 1 |
| 500,000 | British Columbia E. Rail Def. Ord. Stock .. .. | 100 | 6 % | 6 % | 8 % | 8 % | 143 —147 | 143 —147 | .. | .. | .. | 5 9 7 |
| 400,000 | Do. Pref. Ord. Stock .. .. .. .. | 100 | 5 % | 5 % | 5 % | 6 % | 121 —124 | 122 —126 | 125 | .. | +1½ | 4 15 8 |
| 400,000 | Do. 5 % Cum. Perp. Pref. Stock .. .. | 100 | 5 % | 5 % | 5 % | 5 % | 110 —113 | 107 —110 xd | 108½ | 108 | .. | 4 10 11 |
| 288,000 | Do. 4½ % 1st Mort. Debs., 1 to 6,250 .. .. | 40 | 4½% | 4½% | 4½% | 4½% | 99 —101 | 102 —104 | .. | .. | .. | 4 6 7 |
| 212,600 | Do. 4½ % Vancouver Power Debs., 1 to 2,200 | 100 | 4½% | 4½% | 4½% | 4½% | 102 —105 | 101 —104 xd | .. | .. | .. | 4 6 7 |
| 188,801 | British Electric Traction .. .. .. .. | 10 | 3 % | Nil | Nil | .. | ⅜ — ⅞ | ⅜ — ⅞ | 15/- | 10/- | .. | Nil |
| 161,487 | Do. do. 6 % Cum. Pref. .. .. .. | 10 | 6 % | 6 % | 3 % | 1½% | 2¾ — 2¾ | 2¾ — 2¾ | 51/3 | 47/6 | — ⅛ | 4 10 11 |
| 1,478,658 | Do. do. 5 % Perp. Deb. Stock .. | Stock | 5 % | 5 % | 5 % | 5 % | 86 — 90 | 86 — 90 | 89 | 88 | .. | 5 11 1 |
| 598,986 | Do. do. 4½ % 2nd Deb. Stock Red. | 100 | 4½% | 4½% | 4½% | 4½% | 66 — 70 | 66 — 70 | .. | .. | .. | 6 8 7 |
| 100,000 | British Insulated and Helsby Cables .. .. | 5 | 8 % | 10 % | 10 % | 10 % | 7⅜ — 7⅝ | 7⅜ — 7⅝ | .. | .. | .. | 6 9 0 |
| 100,000 | Do. do. 6 % Cum. Pref. .. .. .. | 5 | 6 % | 6 % | 6 % | 6 % | 6⅛ — 6⅜ | 6⅛ — 6⅜ | .. | .. | .. | 4 10 7 |
| 600,000 | Do. do. 4½ % 1st Mort. Deb. Red. .. | 100 | 4½% | 4½% | 4½% | 4½% | 103 —106 | 103 —106 | .. | .. | .. | 4 4 11 |
| 304,941 | British Thomson-Houston 4½ % 1st Mort. Debs. .. | 100 | 4½% | 4½% | 4½% | 4½% | 91 — 96 | 91 — 96 | .. | .. | .. | 4 18 11 |
| 400,000 | British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000 | 5 | Nil | Nil | Nil | Nil | 3/16 — 7/16 | 3/16 — 7/16 | .. | .. | .. | Nil |
| 1,016,858 | Do. do. 4 % Mort. Deb. Stock .. | 100 | 4 % | 4 % | 4 % | 4 % | 38 — 42 | 38 — 42 | .. | .. | .. | 9 10 6 |
| 50,000 | Browett, Lindley & Co., Ord. .. .. .. .. | 1 | Nil | Nil | Nil | .. | 9/16 — 11/16 | 9/16 — 11/16 | .. | .. | .. | Nil |
| 50,000 | Do. do. 6 % Cum. Pref. .. .. .. | 1 | Nil | Nil | Nil | .. | 14/6 to 15/6 | 14/6 to 15/6 | .. | .. | .. | Nil |
| 140,976 | Brush Electrical Engineering, Ord., 1 to 105,781 .. | 2 | 2½% | Nil | Nil | Nil | 0 — ⅛ | 0 — ⅛ | .. | .. | .. | Nil |
| 200,000 | Do. do. Non-cum. 6 % Pref. .. .. | 2 | 6 % | Nil | Nil | Nil | 0 — ⅛ | 0 — ⅛ | .. | .. | .. | Nil |
| 125,000 | Do. do. 4½ % Perp. Deb. Stock .. | Stock | 4½% | 4½% | 4½% | 4½% | 43 — 48 | 43 — 48 | .. | .. | .. | 8 |
| 125,000 | Do. do. 4½ % Perp. 2nd Deb. Stock.. | Stock | 4½% | 4½% | 4½% | 4½% | 27 — 31 | 27 — 31 | .. | .. | .. | 14 10 2 |
| 187,610 | Calcutta Trams, 1 to 187,610 .. .. .. .. | 5 | 8 % | 8 % | 6 % | .. | 4⅜ — 4⅝ | 4⅜ — 4⅝ | 95/- | .. | .. | 6 6 4 |
| 45,804 | Do. 5 % Cum. Pref., Nos. 1 to 39,880.. | 5 | 5 % | 5 % | 5 % | 5 % | 4½ — 5 | 4½ — 5 | .. | .. | .. | 5 0 0 |
| 850,000 | Do. 4½ % 1st Deb. Stock.. .. .. | 100 | 4½% | 4½% | 4½% | 4½% | 97 —100 | 97 —100 | £8½ | .. | .. | 4 19 0 |
| 85,000 | Callender's Cable Construction shares .. .. | 5 | 15 % | 15 % | 15 % | .. | 9⅝ — 10½ | 9⅝ — 10⅝ | 10⅜ | .. | .. | 7 2 10 |
| 40,000 | Do. do. 5 % Cum. Pref. .. .. .. | 5 | 5 % | 5 % | 5 % | .. | 5¼ — 5½ | 5¼ — 5½ | .. | .. | .. | 4 15 8 |
| 800,000 | Do. do. 4½ % 1st Mort. Deb. Stock Red. | Stock | 4½% | 4½% | 4½% | 4½% | 104 —106 | 103½ —105½ | .. | .. | .. | 4 4 11 |
| 491,223 | Cape F. Trams., 1 to 491,223 .. .. .. .. | 1 | Nil | Nil | Nil | .. | ⅜ — ⅝ | ⅜ — ⅝ | .. | .. | .. | Nil |
| 450,000 | Castner-Kellner Alkali, 1 to 450,000 .. .. | 1 | 6 % | 8 % | 12 % | .. | 1½ — 2 | 1½ — 2 | 38/6 | 37/6 | .. | 6 0 0 |
| 210,153 | Do. do. 4½ % 1st Mort. Deb. Stock | 100 | 4½% | 4½% | 4½% | .. | 103 —106 | 103 —106 | .. | .. | .. | 4 4 11 |
| 1,890,690 | Central London Railway, Ord. Stock .. .. | Stock | 4 % | 4 % | 3 % | 3½% | 61 — 63 | 61 — 63 | 61½ | .. | .. | 5 3 2 |
| 554,655 | Do. do. 4 % Pref. Stock .. .. | Stock | 4 % | 4 % | 4 % | 4 % | 83 — 85 | 83 — 85 | 84¼ | .. | .. | 4 14 2 |
| 554,655 | Do. do. Def. do. .. .. | Stock | 4 % | 4 % | 2 % | 2½% | 43 — 45 | 43 — 45 | 32½ | 31¾ | .. | 5 11 1 |
| 1,400,000 | City and South London Railway .. .. | Stock | 1½% | 2½% | 2½% | 1½% | 31 — 33 | 31½ — 32½ | .. | .. | + ⅛ | 4 12 4 |
| 86,000 | Crompton & Co., Nos. 1 to 85,940 .. .. .. | 5 | 2½% | 5 % | 5 % | 5 % | 1 — 1½ | ⅞ — 1 | 20/- | 18/9 | — 1/16 | 15 0 0 |
| 100,000 | Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red. | .. | 5 % | 5 % | 5 % | 5 % | 91 — 94 | 91 — 94 | .. | .. | .. | 5 6 5 |

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List

Continued on next page

## SHARE LIST OF ELECTRICAL COMPANIES.—(Continued.)

### ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(Continued)

| Present Issue. | NAME. | Stock or Share. | Dividends for the last four years. 1906. | 1906. | 1907. | 1908. | Closing Quotations July 13th. | Closing Quotations July 20th. | Business done week ended July 20th, 1909. Highest | Lowest. | Rise + or Fall — | Present Yield per cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | * | | | | | | | | | | £ s. d. |
| 250,000 | Dick, Kerr & Co., 1 to 250,000 | 1 | 10 % | 10 % | 10 % | 10 % | 1 1/16 — 1 1/8 | 1 1/16 — 1 1/8 | .. | .. | .. | 8 0 0 |
| 805,000 | Do. do. 6 % Cum. Pref., 1 to 805,000 | 1 | 6 % | 6 % | 6 % | 6 % | 1 3/16 — 1 5/16 | 1 3/16 — 1 5/16 | .. | .. | .. | 4 16 0 |
| 271,080 | Do. do. 4½ % Deb. Stock | 100 | 4½ % | 4½ % | 4½ % | 4½ % | 99 —102 | 99 —102 | .. | .. | .. | 4 8 3 |
| 60,000 | Dublin United Trams. (1896), 6 % Pref., 1 to 60,000 | 10 | 6 % | 6 % | 6 % | 6 % | 13 — 14 | 13 — 14 | .. | .. | .. | 4 5 9 |
| 99,261 | Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261 | 5 | 4½ % | 4½ % | 2½ % | .. | 1/4 — 3/8 | 1/4 — 3/8 | .. | .. | — 1/8 | 25 0 0 |
| 17,189 | Do. "A" shares, 01—017,189 | 5 | 4½ % | 4½ % | 2½ % | .. | 1¼ — 2⅜ | 1¼ — 2⅜ | .. | .. | .. | 5 0 0 |
| 307,895 | Do. 4 % Deb. Stock Red. | 100 | 4 % | 4 % | 4 % | 4 % | 68 — 73 | 68 — 73 | .. | .. | .. | 5 9 7 |
| 67,720 | Do. 5 % 2nd Deb. Stock Prov. Certs. all pd. | 100 | 5 % | 5 % | 5 % | .. | 84 — 87 | 84 — 87 | .. | .. | .. | 5 12 |
| 112,100 | Electric Construction, 1 to 112,100 | 2 | Nil | Nil | Nil | Nil | 1/8 — 1/4 | 1/8 — 1/4 | .. | .. | .. | Nil |
| 81,890 | Do. do. 7 % Cum. Pref., 1 to 81,890 | 2 | 7 % | 7 % | 7 % | 7 % | 1 1/16 — 1 1/8 | 1 1/16 — 1 1/8 | .. | .. | .. | 8 7 2 |
| 25,000 | General Electric Co. (1900), 5 % Cum. Pref. | 10 | 5 % | 5 % | 5 % | .. | 7/8 — 7 5/8 | 7/8 — 7/8 | .. | .. | .. | 6 13 4 |
| 200,000 | Do. do 4 % Mort Deb. | Stock | 4 % | 4 % | 4 % | 4 % | 85 — 88 | 85 — 88 | .. | .. | .. | 4 10 11 |
| 78,000 | Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000 | 10 | 4 % | 4 % | 4 % | Nil | 3/4 — 1 | 3/4 — 1 | .. | .. | .. | 6 13 4 |
| 96,000 | Greenwood & Batley, 7 % Cum. Pref. | 10 | 7 % | 7 % | 7 % | .. | 10½ — 10⅝ | 10½ — 10⅝ | .. | .. | .. | 6 10 3 |
| 80,000 | Do. do. 5 % Mort. Debs. | 100 | 5 % | 5 % | 5 % | 5 % | 102 —103½ | 102 —103 | .. | .. | .. | 4 16 10 |
| 40,000 | Henley's (W. T.), Telegraph Works, Ord. | 5 | 15% | 15 % | 15% | 15 % | 11⅜ — 12½ | 11⅜ — 12½ | 12½ | .. | .. | 6 5 0 |
| 40,000 | Do. do. 4½ % Pref. | 5 | 4½ % | 4½ % | 4½ % | 4½ % | 5 — 5⅛ | 5 — 5⅛ | 5 3/8 | .. | .. | 4 8 9 |
| 150,000 | Do. do. 4½ % Mort. Deb. Stock | Stock | 4½ % | 4½ % | 4½ % | 4½ % | 105 —107 | 105 —107 | .. | .. | .. | 4 4 1 |
| 50,000 | India-Rubber, Gutta-percha & Telegraph Works | 10 | 10% | 10 % | 10 % | .. | 14½ — 15½ | 14½ — 15½ | .. | .. | .. | 6 11 2 |
| 37,500 | †Liverpool Overhead Railway, Ord. | 10 | Nil | Nil | 1½ | Nil | 7/8 — 1 1/8 | 7/8 — 1 | .. | .. | .. | Nil |
| 10,000 | Do. do. Pref., fully paid | 10 | 5 % | 5 % | 5 % | 5 % | 5 — 6 | 5 — 6 | .. | .. | .. | 8 6 8 |
| 600,070 | London United Trams, (1901), 1 to 50,007 | 10 | 8 % | 8 % | 8 % | Nil | 2 — 3 | 1½ — 2½ | .. | .. | — ½ | Nil |
| 899,980 | Do. do. 50,008 to 100,000 | 10 | 8 % | 8 % | 8 % | Nil | 3½ — 4 | 1½ — 2½ | .. | .. | —1½ | Nil |
| 125,000 | Do. do. 5 % Cum. Pref., 1 to 125,000 | 10 | 5 % | 5 % | 5 % | 3⅜ % | 1½ — 2½ | 2 — 2½ | 40/- | .. | + ½ | 12 0 0 |
| 1,331,000 | Do. do. 4 % 1st Mort. Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 63 — 67 | 65 — 68 | 66½ | 66 | +1¼ | 5 17 8 |
| 5,732,062 | Metropolitan Consolidated | 100 | 2½ % | 1 % | 1½ % | 1½ % | 39½ — 40 | 40½ — 40⅞ | 41⅛ | 39⅜ | + ⅜ | 1 4 6 |
| 2,640,914 | Do. Surplus Lands | 100 | 2½ % | 2½ % | 2½ % | 2½ % | 68 — 70 | 68 — 70 | 68⅜ | 67 | .. | b 13 7 |
| 5,335,000 | Do. District | 100 | Nil | Nil | Nil | Nil | 17½ — 18 | 17½ — 18 | 17 11/16 | 17⅜ | .. | Nil |
| 891,827 | Metropolitan Electric Trams., Ord. | 1 | .. | .. | .. | 4½ % | 3/8 — 3/4 | 3/8 — 3/4 | 1/- | .. | .. | .. |
| 314,016 | Do. do. Defd. | 1 | Nil | Nil | Nil | Nil | 3/4 — 7/8 | 3/4 — 7/8 | 16/- | 15/6 | .. | Nil |
| 500,000 | Do. do. 6 % Cum. Pref. | 1 | 5 % | 5 % | 5 % | 5 % | 7/8 — 15/16 | 7/8 — 15/16 | .. | .. | .. | 5 19 5 |
| 865,600 | Do. do. 4½ % Deb. Stock Red. | 100 | 4½ % | 4½ % | 4½ % | 4½ % | 95 — 97 | 96½ — 98½ | 98 | .. | .. | 4 12 9 |
| $10,823,200 | Mexico Trams Co., Common Stock | .. | .. | .. | .. | .. | 131 —134 | 130 —132 | 132½ | 130½ | —1½ | .. |
| $9,000,000 | Do. 1st Mort. 50-year 5% Gld. Bds. | .. | .. | .. | .. | 5 % | 91½ — 93½ | 92½ — 94½ | 93¾ | 13½ | +1 | 5 5 10 |
| 245,500 | Potteries Electric Traction | 1 | 4 % | 4 % | 4 % | Nil | 1/8 — 1/4 | 1/8 — 1/4 | .. | .. | .. | 8 18 0 |
| 245,500 | Do. 6 % Cum. Pref. | 1 | 5 % | 5 % | 6 % | 5 % | 1/2 — 5/8 | 1/2 — 5/8 | .. | .. | .. | 6 17 11 |
| 245,000 | Do. 4½ % Deb. Stock | 100 | 4½ % | 4½ % | 4½ % | 4½ % | 88 — 89 | 86 — 89 | .. | .. | .. | 5 1 9 |
| 57,350 | Telegraph Construction and Maintenance | 12 | 15 % | 15 % | 7½ % | 15 % | 33 — 34½ | 33½ — 35 | .. | .. | + ½ | 5 1 11 |
| 140,000 | Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909 | 100 | 4 % | 4 % | 4 % | 4 % | 101 —103 | 99 —101 | .. | .. | .. | 3 19 3 |
| 1,000,000 | Underground Electric Railway, 5% Prior Lien | .. | .. | .. | .. | .. | 102 —103 | 102½ - 103½ | 10 1/2 | 10 3/4 | + ⅛ | .. |
| 2,800,000 | Do. do. 4½% Bonds | .. | .. | .. | .. | 4½ % | 87 — 89 | 87 — 89 | 88⅝ | 87⅛ | .. | 5 1 2 |
| 4,900,000 | Do. do. 6% Income Bonds | .. | .. | .. | .. | .. | 37 — 39 | 37 — 39 | 37 | .. | .. | .. |
| 66,666 | Willans & Robinson, 1 to 30,000 & 80,001 to 116,666 | 5 | Nil | Nil | 10 % | Nil | 1/8 — 1/4 | 1/8 — 1/4 | .. | .. | .. | .. |
| 66,666 | Do. 6 % C.P., 30,001 to 30,000 & 125,001 to 141,666 | 1 | Nil | .. | 6 % | 6 % | 2 — 2½ | 2 — 2½ | .. | .. | .. | 7 7 4 |
| 215,495 | Do. % 1st Mort. Deb. Stock | .. | 4 % | 4 % | 4 % | 4 % | 76 — 80 | 76 — 80 | 78½ | 78½ | .. | 5 0 0 |

### ELECTRICITY SUPPLY COMPANIES.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15,000 | Bromley (Kent) E.L. & P., 1 to 15,000 | .. | 5½% | 5½% | 5½% | 5½% | 4½ — 4⅝ | 4½ — 4⅝ | .. | .. | .. | 5 10 0 |
| 70,000 | Do. do. 4½ % 1st. deb. stock | 100 | 4½% | 4½% | 4½% | 4½% | 93 — 96 | 93 — 96 | .. | .. | .. | 4 18 9 |
| 80,449 | Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000 | 5 | 10 % | 10% | 10 % | 10 % | 8 — 8⅛ | 8 — 8⅛ | 8⅛ | .. | .. | 5 17 8 |
| 9,551 | Do. do. 7 % Cum. Pref. | 5 | 7 % | 7 % | 7 % | 7 % | 8 — 8⅛ | 8 — 8⅛ | .. | .. | .. | 4 9 4 |
| 886,876 | Central Electric Supply 4 % Guar. Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 97 —100 | 97 - 100 | .. | .. | .. | 3 18 5 |
| 80,000 | Charing Cross and Strand Electricity Supply | 5 | 5 % | 5 % | 5 % | 5 % | 3⅞ — 4⅛ | 3⅞ — 4⅛ | 86/3 | 85/- | .. | 5 14 3 |
| 80,000 | Do. do. do. 4½ % Cum. Pref. | 5 | 4½% | 4½% | 4½% | 4½% | 4⅛ — 4⅜ | 4⅛ — 4⅜ | .. | .. | .. | 4 12 4 |
| 80,000 | Do. "City Undertaking" 4½ % Cum. Prf. | 5 | 4½% | 4½% | 4½% | 4½% | 3⅞ — 4⅛ | 3⅞ — 4⅛ | .. | .. | .. | 5 5 11 |
| 443,736 | Do. do. 4 % Deb. Stock Red. | 100 | 4 % | 4 % | 4 % | 4 % | 96 — 99 | 96 — 99 | .. | .. | .. | 3 19 3 |
| 49,486 | Chelsea Electricity Supply, Ord. | 5 | 4½% | 4½% | 4½% | 4½% | 3⅝ — 4⅛ | 3⅝ — 4⅛ | .. | .. | .. | 5 9 1 |
| 175,000 | Do. do. 4½ % Deb. Stock Red. | Stock | 4½% | 4½% | 4½% | 4½% | 100 —103 | 100 —103 | .. | .. | .. | 4 7 6 |
| 70,595 | City of London Elec. Lighting, Ord. 40,001—110,595 | 10 | 6 % | 6 % | 6 % | 6 % | 10¼ — 11 | 10¼ — 11 | 10 3/4 | 10 3/4 | .. | 5 9 1 |
| 40,000 | Do. 6 % Cum. Pref., 1 to 40,000 | 10 | 6 % | 6 % | 6 % | 6 % | 12 — 12⅝ | 12 — 13 | 12⅝ | 12 7/8 | + ⅛ | 4 12 4 |
| 400,000 | Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd. | .. | 5 % | 5 % | 5 % | 5 % | 121 —124 | 1.1 —124 | .. | .. | .. | 4 0 8 |
| 800,000 | Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd. | 100 | 4½% | 4½% | 4½% | 4½% | 99 —102 | 99 —102 | .. | .. | .. | 4 8 3 |
| 50,000 | County of Durham Electrical Power, Ord. | 5 | 4 % | 4 % | 2 % | .. | 2⅜ — 2½ | 2⅜ — 2½ | .. | .. | .. | 3 6 8 |
| 50,000 | Do. do. do. 5 % Pref. | 5 | 5 % | 5 % | 5 % | 5 % | 3½ — 3⅝ | 3½ — 3⅝ | .. | .. | .. | 6 13 4 |
| 220,000 | Do. do. do. 5 % 1st Mtg. Deb. | Stock | .. | .. | .. | 5 % | 93½ — 95½ | 93½ — 95½ | .. | .. | .. | 5 4 9 |
| 40,000 | County of London Electric Lighting, Ord. 1—40,000 | 10 | 5 % | 5 % | 5 % | 5 % | 8½ — 8⅝ | 8½ — 8⅝ | .. | .. | .. | 5 14 3 |
| 55,000 | Do. do. 6 % Pref., 40,001—60,000 | 10 | 6 % | 6 % | 6 % | 6 % | 10⅜ — 11⅛ | 10⅜ — 11⅛ | 10 21/32 | 10⅜ | .. | 5 6 8 |
| 400,000 | Do. do. 4½ % Deb. Stock | .. | 4½% | 4½% | 4½% | 4½% | 103 —106 | 103 —106 | 104⅛ | 104⅛ | .. | 4 4 11 |
| 400,000 | Do. do. 4½ % 2nd. Deb. Stock | Stock | 4½% | 4½% | 4½% | 4½% | 100 —103 | 100 —103 | 101½ | 101⅜ | .. | 4 7 5 |
| 80,000 | Edmundson's Electric Corporation, Ord. Shares | 5 | 4 % | Nil | Nil | Nil | 1/16 — 1/8 | 1/16 — 1/8 | .. | .. | .. | Nil |
| 80,000 | Do. do. 6 % Cum. Pref. | 5 | 6 % | 8 % | Nil | Nil | 1/8 — 1/4 | 1/8 — 1/4 | .. | .. | .. | Nil |
| 480,500 | Do. do. 4½ % 1st Mort. Deb. Stk. | 100 | 4½% | 4½% | 4½% | 4½% | 60 — 63 | 59 — 62 xd | .. | .. | .. | 7 5 2 |
| $8,150,000 | Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds. | $500 | .. | .. | .. | 5 % | 85½ — 88½ | 85½ — 88½ | .. | .. | .. | 5 13 0 |
| 10,000 | Folkestone, 1 to 10,000 | 5 | 5½% | 5½% | 5½% | 5½% | 4⅝ — 5 | 4⅝ — 5 | .. | .. | .. | 5 10 0 |
| 10,000 | Do. 5 % Cum. Pref., 1 to 10,000 | 5 | 5 % | 5 % | 5 % | 5 % | 5 — 5⅛ | 5 — 5⅛ | .. | .. | .. | 4 10 0 |
| 90,000 | Do. 4½ % 1st Deb. Stock | 100 | 4½% | 4½% | 4½% | 4½% | 98 —101 | 98 —101 | .. | .. | .. | 4 9 1 |
| 15,000 | Hove, 1 to 15,000 | 5 | 9 % | 9 % | 8½% | 8½% | 7⅞ — 7⅞ | 7⅛ — 7⅞ | .. | .. | .. | 5 11 6 |
| $1,376,000 | Kaministiquia Power Co., 5 % Gold Bnds. | .. | .. | .. | .. | 5 % | 97⅛—100⅛ | 97⅛—100⅛ | 98⅜ | 98⅛ | .. | 4 19 6 |
| 21,000 | Kensington and Knightsbridge Electric Ord. | 5 | 10 % | 10 % | 10 % | 8 % | 6⅛ — 7⅛ | 6⅛ — 7⅛ | .. | .. | .. | 5 8 6 |
| 90,000 | Do. do. do. 4 % Deben. Stk. | Stock | 4 % | 4 % | 4 % | 4 % | 97 — 100 | 97 — 100 | .. | .. | .. | 3 19 8 |
| 111,000 | London Electric Supply Corporation, Limited, Ord. | 9 | 4 % | 4 % | 3½ % | 3 % | 1⅞ — 2⅛ | 1⅞ — 2⅛ | .. | .. | .. | 4 16 0 |
| 70,000 | Do. do. do 6 % Pref. | 5 | 6 % | 6 % | 6 % | 6 % | 5⅛ — 5⅝ | 5⅛ — 5⅝ | 5 3/8 | .. | .. | 5 11 8 |
| 283,255 | Do. do. 4 % 1st Mort. Deb. Stock | Stock | 4 % | 4½% | 4½% | 4 % | 98 — 97 | 98 — 97 | .. | .. | .. | 4 2 6 |
| 200,000 | Metropolitan Electric Supply, 1 to 100,000 | 5 | 10 % | 8 % | 6½% | 5 % | 4⅛ — 4⅜ | 4⅛ — 4⅜ | 90/- | .. | .. | 5 8 1 |
| 76,121 | Do. 4½ % Cum. Pref. 1—71,105 | 5 | 4½% | 4½% | 4½% | 4½% | 4⅜ — 5 | 4⅜ — 5 | 97/6 | .. | .. | 4 10 0 |
| 225,000 | Do. 4½ % 1st Mort. Deben. Stock | .. | 4½% | 4½% | 4½% | 4½% | 105 —108 | 105 —108 | .. | .. | .. | 4 3 4 |
| 248,000 | Do. 5% Mort. Deben. Stock Redem. | Stock | 5½% | 5½% | 5½% | 5½% | 83½ — 86½ | 83½ — 86½ | 83⅞ | 83⅛ | .. | 4 0 11 |
| $6,000,000 | Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds | .. | 5 % | 5 % | 5 % | 5 % | 82 — 84 | 82 — 84 | 83¼ | 82⅛ | .. | 6 1 11 |
| 12,585,000 | Do. Light and Power Co., Ltd., Common | $100 | .. | .. | .. | 3½% | 65 — 68 | 68 — 72 | 71 | 65 | + 3½ | 4 17 3 |
| $2,400,000 | Do. do. 7% Cum. Pref. Stk. | Stock | .. | .. | .. | 7 % | 104 —108 | 103 —107 | 106 | .. | —1 | 6 10 10 |
| $12,000,000 | Do. do. 5% 1st Mtg. Gold Bnds. | .. | .. | .. | .. | 5 % | 88 — 89 | 87½ — 89½ | 89⅜ | 88⅜ | .. | 5 12 4 |
| 950,000 | Midland Electric Corporation, 4½ % 1st Mort. Deb. | 100 | 4½% | 4½% | 4½% | 4½% | 92 — 96 | 94 — 97 | .. | .. | + 1½ | 4 12 9 |
| 180,491 | Newcastle-on-Tyne, 1 to 87,500 | 5 | 8 % | 8 % | 8 % | 2½ % | 4⅜ — 5⅛ | 4⅜ — 5⅛ | .. | .. | .. | 2 7 8 |
| 137,000 | Do. 5 % Pref., 1 to 87,500 | 5 | 5 % | 5 % | 5 % | 5 % | 4⅜ — 5⅛ | 4⅜ — 5⅛ | .. | .. | .. | 4 15 3 |
| 196,500 | North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265 | 100 | .. | .. | .. | .. | 99 — 101 | 99 —101 | .. | .. | .. | .. |
| 10,853 | Notting Hill Electric Lighting | 10 | 7½% | 7½% | 7½% | 7 % | 11½ — 12½ xd | 11½ — 12½ xd | .. | .. | .. | 5 14 3 |
| 20,000 | Oxford, 1 to 96 and 407 to 20,310 | 5 | 7 % | 7 % | 7 % | .. | 6 — 6⅛ | 6 — 6⅛ | .. | .. | .. | 5 7 3 |
| 50,000 | Do. 4 % Deb. Stock | 100 | 4 % | 4 % | 4 % | 4 % | 94 — 97 | 92 — 95 xd | .. | .. | .. | 4 4 3 |
| 119,694 | River Plate Elcty. Co. Ord. Nos. 1 to 120,507 | 1 | .. | 3½% | 6 % | 8 % | 1⅝ — 1⅞ | 1⅝ — 1⅞ | 28/3 | .. | .. | 5 7 3 |
| 100,000 | Do. do. 8% Non Cum. Pref. Nos. 1 to 100,000 | 1 | 6 % | 6 % | 6 % | 6 % | 1⅛ — 1⅜ | 1⅛ — 1⅜ | 20/- | .. | .. | 5 10 4 |
| 200,000 | Do. do. 5% Deb. Stk. Red. | 100 | 5 % | 5 % | 5 % | 5 % | 102 —105 | 102 —105 | 104½ | 103⅜ | .. | 5 8 1 |
| 40,000 | St. James' and Pall Mall Electric Light, Ord. | 5 | 12½% | 10 % | 10 % | 10 % | 8⅞ — 9⅛ | 8⅞ — 9⅛ | 9 1/16 | .. | .. | 6 13 4 |
| 99,000 | Do. do. 7 % Pref. 80,001 to 40,660 | 5 | 7 % | 7 % | 7 % | 7 % | 7 — 7⅛ | 7 — 7⅛ | 7 1/16 | .. | .. | 4 13 4 |
| 459,000 | Do. do. 3½ % Deb. Stock Red. | 100 | 3½% | 3½% | 3½% | 3½% | 84 — 88 | 84 — 88 | .. | .. | .. | 3 19 7 |
| 12,000 | Smithfield Markets Electric Supply, Ord. | 5 | 4 % | Nil | Nil | Nil | 1/16 — 1/8 | 1/16 — 1/8 | .. | .. | .. | Nil |
| 25,000 | South London Electric Supply, Ord. | 1 | 4 % | 3 % | 4 % | 5 % | 3/4 — 7/8 | 3/4 — 7/8 | .. | .. | .. | 6 9 0 |
| 125,000 | South Met. Elec. Lt. & Power, Ord. | 1 | 2½% | 3½% | 2½% | 2½% | 7/16 — 1/2 | 7/16 — 1/2 | .. | .. | .. | 4 8 11 |
| 142,968 | Do. do. 7 % Pref. | 1 | 7 % | 7 % | 7 % | 7 % | 1⅛ — 1⅜ | 1⅛ — 1⅜ | .. | .. | .. | 5 6 8 |
| 224,520 | Do. do. 4½ % 1st Deb. Stk. | 100 | 4½% | 4½% | 4½% | 4½% | 100 —103 | 100 —103 | .. | .. | .. | 4 0 0 |
| 80,000 | Urban Electric Supply, Ord. | 5 | 5 % | 5 % | 5 % | 5 % | 1 — 1⅛ | 1 — 1⅛ | .. | .. | .. | 25 0 0 |
| 50,000 | Do. do. 5 % Cum. Pref. | 5 | 5 % | 5 % | 5 % | 5 % | 2⅛ — 2½ | 2⅛ — 2½ | .. | .. | .. | 11 2 2 |
| 275,000 | Do. do. 4½ % 1st Mort. Db. Stk. Red. | 100 | 4½% | 4½% | 4½% | 4½% | 80 — 84 | 80 — 84 | .. | .. | .. | 5 7 2 |
| 808,000 | Victoria Falls Power Co., Pref. Nos. 1 to 800,000 | 1 | .. | .. | .. | 5 % | 3/8 — 3/4 | 3/8 — 3/4 | 16/10½ | 16/8 | .. | 5 19 5 |
| 110,000 | Westminster Electric Supply, Ord. | .. | 12 % | 12 % | 10 % | 10 % | 8½ — 9½ | 8½ — 9½ | .. | .. | — ½ | 6 11 2 |
| 81,979 | Do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905) | 5 | 5 % | 4½% | 4½% | 4½% | 5 — 5⅛ | 4⅛ — 5⅛ xd | 5 | .. | .. | 4 3 9 |

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount 2½ per cent., April 1st, 1909.

# EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING JUNE, 1909.

The June returns of electrical business show a slight improvement over the previous month's figures.

The exports, with a total of £270 268, are barely a thousand pounds ahead of the amount recorded in May. The imports, totalling £158,119, as against £122,762 in the previous month, make a better showing, comparatively, although only slightly above the monthly average of 1908. The re-exports amounted to £12,034, as compared with £10,023 in May.

For the sake of comparison with previous years' returns, in the case of the exports, it is interesting to note that the total business, less telegraphic, amounted to approximately £250,000 for the month—the highest amount yet recorded, and comparable with a monthly average of £213,000 in 1908. In connection with this it may be observed that telegraphic exports fell some £30,000, and electrical machinery improved by £20,000 as compared with the May figures, while the cable export was also higher.

In the import section the improved total is largely attributable to increased telegraphic and telephonic importation. There was also a £7,000 increase in the value of lamps sent into this country, but a fall of £5,000 in cable imports

Japan was the most prominent purchaser from this country, and Germany the largest importer, as usual, during the month.

## Registered Exports of British and Irish Electrical Goods from the United Kingdom.

| Country receiving exports and importing. | Electrical goods and appliances. | Wires and cables, rubber and other insulations. | Electric lighting fittings and accessories. | Electric lamps and parts. | Electric meters and instruments. | Electric machinery. | Electrically-driven machinery. | Batteries and accumulators. | Carbons. | Telephonic cable and apparatus and electric bells. | Telegraphic cable and apparatus. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ |
| Russia, Sweden, Norway and Denmark ... | 710 | 829 | 174 | 96 | 67 | 4,606 | ... | 56 | ... | 93 | 106 | 6,737 |
| Germany ... ... ... ... ... ... | 224 | 2,572 | 17 | 102 | 47 | 909 | ... | 8 | 80 | 87 | 448 | 4,494 |
| Netherlands and Java ... ... ... ... | 377 | 179 | 34 | 10 | 13 | 909 | ... | ... | ... | 81 | ... | 1,603 |
| Belgium ... ... ... ... ... ... | 113 | 171 | 6 | 50 | 69 | 813 | 16 | 50 | ... | 135 | 233 | 1,676 |
| France and French Indo-China ... ... | 81 | 85 | 39 | 474 | 78 | 1,511 | ... | 37 | ... | 182 | 2,516 | 5,003 |
| Switzerland ... ... ... ... ... | 19 | ... | 12 | ... | ... | 29 | ... | ... | ... | 48 | ... | 108 |
| Portugal, Madeira, Azores & Portuguese Africa | 225 | 79 | ... | 88 | 27 | 2,892 | 25 | 157 | ... | 157 | 80 | 3,730 |
| Spain and Canary Isles... ... ... ... | 139 | ... | 99 | 211 | ... | 400 | 1,520 | 14 | ... | ... | 2,420 | 4 803 |
| Italy and Austria-Hungary ... ... ... | 321 | ... | 8 | ... | 205 | 1,381 | 749 | 5,520 | ... | 39 | ... | 8,223 |
| Greece, Roumania and Turkey... ... ... | 86 | ... | ... | 106 | 8 | 65 | 1.5 | 32 | ... | 12 | 66 | 500 |
| Channel Isles, Gibraltar and Malta ... ... | 79 | 36 | 21 | 47 | 137 | 78 | 4 | ... | ... | 12 | 27 | 441 |
| U.S.A , Philippines and Hayti... ... ... | 882 | ... | ... | 104 | 61 | 137 | ... | ... | 94 | ... | 748 | 2,026 |
| Canada ... ... ... ... ... ... | 865 | 2,733 | 194 | 564 | 190 | 8,820 | 35 | 30 | ... | 833 | 4,929 | 19,193 |
| British West Indies and British Guiana ... | ... | 21 | 20 | 131 | 13 | 50 | ... | 87 | ... | 58 | ... | 380 |
| Mexico, Nicaragua, Ecuador, Colombia and Venezuela ... ... ... ... | ... | ... | 28 | 10 | 406 | 58 | ... | ... | ... | 13 | 18 | 533 |
| Bolivia, Peru and Uruguay ... ... ... | 106 | 56 | 199 | 137 | 3 | 404 | 660 | 13 | .. | 5 | 784 | 2,367 |
| Chile ... ... ... ... ... ... | 52 | ... | 222 | 340 | 123 | 6,741 | 1,747 | 46 | 83 | 533 | 37 | 9,924 |
| Brazil ... ... ... ... ... ... | 168 | 173 | 83 | 178 | 1,388 | 8,511 | ... | 110 | 21 | 6 | 1,246 | 11,884 |
| Argentine ... ... ... ... ... | 957 | 15,149 | 963 | 845 | 341 | 4,184 | 1,413 | 585 | 80 | 1,445 | 675 | 26,637 |
| Egypt ... ... ... ... ... ... | 10 | 461 | 109 | .. | 5 | 423 | ... | 4 | ... | 805 | 46 | 1,863 |
| British West Africa ... ... ... ... | 196 | 28 | 6 | 11 | ... | 39 | ... | 53 | ... | 96 | 101 | 530 |
| Cape of Good Hope ... ... ... ... | 259 | 382 | 303 | 61 | 151 | 1,612 | 24 | 1,580 | 13 | .. | ... | 4,385 |
| Natal ... ... ... ... ... ... | 1,037 | 3,012 | 223 | 460 | 49 | 5,228 | ... | 18 | 56 | 30 | 285 | 10,418 |
| Rhodesia, Orange River Colony and Transvaal | 542 | 1,500 | 186 | 415 | 183 | 5,400 | ... | 519 | 79 | .. | ... | 8,824 |
| Zanzibar, Brit. East Africa, Mauritius and Aden | 153 | 165 | 40 | 112 | 44 | 157 | 42 | ... | ... | 17 | 39 | 769 |
| China and Siam ... ... ... ... ... | 688 | 41 | 110 | 108 | 17 | 2,669 | 964 | 101 | ... | 7 | 603 | 5,308 |
| Japan and Korea ... ... ... ... | 157 | 19,371 | 646 | ... | 432 | 23,868 | 3,224 | .. | ... | 1,450 | 92 | 49,240 |
| India ... ... ... ... ... ... | 2,004 | 4,483 | 1,178 | 1,127 | 654 | 10,422 | 950 | 664 | 302 | 1,728 | 2,988 | 26,500 |
| Ceylon ... ... ... ... ... ... | 24 | 223 | 10 | 21 | ... | 43 | 66 | 58 | ... | 127 | 16 | 188 |
| Straits Settlements and Fed. Malay States | 95 | 767 | 51 | 104 | 41 | 1,318 | ... | 115 | 17 | 121 | 204 | 2,833 |
| Hong Kong ... ... ... ... ... | 136 | 511 | ... | 196 | ... | 177 | 3 | 11 | 14 | 113 | 39 | 1,200 |
| West Australia ... ... ... ... ... | 747 | 22 | ... | 79 | 52 | 527 | ... | ... | ... | ... | 74 | 1,501 |
| South Australia ... ... ... ... ... | 192 | 774 | 239 | 31 | 40 | 2,050 | ... | 3 | ... | 2,434 | ... | 5,763 |
| Victoria ... ... ... ... ... ... | 618 | 2,586 | 86 | 338 | 58 | 860 | ... | 312 | ... | 9,226 | 59 | 14,143 |
| New South Wales ... ... ... ... | 2,303 | 1,396 | 144 | 865 | 594 | 7,092 | 62 | 193 | ... | 178 | 660 | 13,117 |
| Queensland and Tasmania ... ... ... | ... | 124 | ... | 27 | 65 | 1,513 | ... | 60 | ... | 45 | 262 | 2,096 |
| New Zealand ... ... ... ... ... | 291 | 1,466 | 206 | 459 | 2 | 7 516 | 106 | 348 | ... | 22 | 512 | 10,928 |
| Total, £ | 14,856 | 59,325 | 5,656 | 7,627 | 5,583 | 113,412 | 11,735 | 10,784 | 839 | 20,138 | 20,313 | 270,268 |

## Registered Imports into the United Kingdom of Electrical Goods from all Countries.

| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Norway, Sweden and Denmark ... ... | ... | ... | 28 | 220 | 9 | 702 | 1,268 | 489 | 36 | 4,291 | 7,043 |
| Germany ... ... ... ... ... ... | 622 | 12,698 | 1,427 | 30,684 | 1,622 | 19,707 | 1,888 | 698 | 4,886 | 15,547 | 89,779 |
| Holland ... ... ... ... ... ... | ... | 285 | ... | 3,213 | ... | ... | ... | ... | 30 | ... | 3,528 |
| Belgium ... ... ... ... ... ... | 356 | 1,184 | 26 | ... | 16 | 1,754 | 12 | 45 | 189 | 11,141 | 14,723 |
| France ... ... ... ... ... ... | 147 | ... | 765 | 2,564 | 886 | 174 | 60 | 1,817 | 2,607 | 7,791 | 16,831 |
| Switzerland ... ... ... ... ... | ... | 147 | 52 | 8 | 200 | 552 | 10 | 8 | 13 | 904 | 1,894 |
| Italy ... ... ... ... ... ... | 56 | 529 | ... | ... | ... | 209 | ... | ... | ... | 354 | 1,178 |
| Austria-Hungary... ... ... ... ... | 23 | 220 | 12 | 206 | ... | 87 | ... | 10 | 3,106 | 355 | 4,019 |
| United States ... ... ... ... ... | 2,804 | 588 | 1,684 | 732 | 379 | 10,249 | 1,910 | 302 | 101 | 234 | 18,983 |
| Total, £ | 4,008 | 5,681 | 3,994 | 37,647 | 3,112 | 33,434 | 5,148 | 3,369 | 10,968 | 40,617 | 157,978 |

Additional imports: Spain, carbons, £77; Canada, lamps, £57; N.S.Wales, electrical machinery, £7.

## Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

| | £ | £ | £ | £ | £ | £ | £ | £ | £ | £ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Various countries, mainly as above ... ... | 1,366 | 307 | ... | 1,744 | ... | 1,363 | ... | 269 | 379 | 6,606 | ... |

Total Exports: £270,268. Total Re-Exports: £12,034. Total Imports: £158,119.

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

## OVERHEAD MAINS.

By WILLIAM COPELAND.

To erect overhead mains on straight roads and good ground is not a matter of great difficulty; but to erect overhead mains in shipyards, dock estates, railway goods sidings and such places is a different matter altogether, and not so simple. There are many difficulties to overcome—*e.g*, the ground where the poles are to be erected is generally built-up ground and not set, and there is often great trouble experienced in staying, there being no room to do this on account of the railroads. Another trouble which is often come across in such places is that distribution is made from certain points; the strain on the poles of three or four heavy mains all going in one direction is great, and not easily dealt with and nothing looks worse than unsightly poles on electric distribution systems.

When commencing to erect overhead mains in the above-mentioned places, the best way is to walk over the ground and make a plan of the positions of the poles, or drive wooden pegs into the ground where the poles are to be erected; after doing so, plan out how the mains are to be run, taking particular care to note where the strain is likely to be, the number of mains on each pole, and where telephone guard wires are to be erected.

When erecting mains in such places, I should recommend poles of not less than 24 ft. from the ground level to the first arm. Wooden poles are to be recommended on account of cheapness. They should be of red fir, free from large knots, and creosoted, and care should be taken to select them with a good taper. When erecting the arms, cap finial and earth wire, care is to be taken that all are connected together at the top, and the wire brought down to the bottom of the pole, and twisted two or three times round the butt to make a good earth.

Wooden arms of sound oak, well seasoned, are to be recommended rather than iron arms when using bare copper mains. Where there is any likelihood of any strain on the insulator, twin oak arms should be fitted on the pole, each fitted with an insulator on each side of the pole to take the strain, and when heavy mains are erected, the arms ought to be strengthened by an oak lath erected in a perpendicular position between the arms on each side of the pole; do not use iron, it is expensive to maintain.

For foundations on such places, concrete is not good on account of so many alterations occurring; it is too expensive to take out the poles, which have to be cut down and spoiled. The best and cheapest way I have found to erect poles in these places is to dig a hole about 6 ft. deep or so, according to the height of the pole, and have four 9-in. wooden deals 5 ft. long placed vertically at the sides of the hole, then place the pole to be erected in the centre of the hole, fill into the hole about a foot of earth, and place a 9-in. deal on each side of the pole, a tight fit. Afterwards fill in the earth and ram well up to 5 ft., then place a 9-in. deal on each side of the pole, a tight fit, and afterwards fill in the earth and ram well up to the ground level. I have found this to give every satisfaction where heavy strain has come on the pole. Where this is likely to be the case a good way is twin a pole and so erect them that the poles are at an angle to each other, so as to divide the strain equally between them; do not erect the poles in parallel. I have had experience in such places with heavy mains, to erect four poles and found they are better on an angle than square.

Insulators and bolts should be strong; $\frac{3}{4}$-in. bolts are considered quite small enough. Guards need not be used when wooden laths are employed. The P.O. insulators have been greatly used, even for high voltages, but the binders are some trouble and expensive to maintain, and are not to be relied on.

I have invented a bindless and practically unbreakable insulator, which can be used for any class of wire or cable. It can be employed for aluminium wires; with a porcelain cover, such an insulator is badly needed for such wires, as great troubles are experienced owing to the action of the binders on the aluminium wire. The insulator is carried on an ordinary bolt which has a square collar, in order to hold or turn it by means of a key or otherwise. The body is a porcelain insulator with the usual sheds, and has a horizontal groove round it which contains the wire, the latter projecting somewhat from the groove. In the top of the insulator is a screwed socket for a stud bolt, this socket being entirely separated from the socket for holding the bolt by a sufficient thickness of porcelain. The stud bolt has an ordinary right-handed screw on each side of a central collar, and there is a cap which can be made of porcelain, or of cast-iron or other like metals. This cap is provided with two slots, so that it can pass over the wire when placed in position, and comes down tight on to the wire. The cap and insulator are preferably somewhat conical in shape, but the cap is rounded at the top.

The mode of erection is as follows:—The bolt being screwed into the insulator in the usual manner, and the stud being also screwed into the insulator, the bolt is put in its supports, but not tightened up. The line wire is placed in the groove, and the cap dropped over, resting on the stud. The cap is now held by the hand and guided centrally, and the bolt turned round until the upper screw of the stud screws tight into the cap and holds the latter tight against the wire.

The wire is now firmly fixed. There is a special value attached to this insulator, for it can be used for a shackle insulator or on a curved or straight line, which is a great consideration when erecting overhead mains in such places; one class of insulator is all that is required.

Bare copper wires are recommended for mains; they are approved of by the Board of Trade, and are much cheaper and lighter, and stand the atmosphere much better; insulated wires are expensive to purchase, not so easy to work with, and carry coal dust, snow and ice, which all give trouble.

When using bare copper mains, do not use the arc lamp poles to carry them, as they are dangerous to pass through when attending to the arc lamps.

Connections from the mains should be made of bare copper, preferably solid copper wrapped with Blackley tape and varnished; these are more suitable to withstand the winds. It is not uncommon to use insulated wire with coils of a pretty spiral form, about twice the length they should be, and when the wind blows a few weeks afterwards the connections break and the lights go out. Bare copper connections are much stronger, and will last for years if properly made.

When a number of connections are taken off the mains and the mains are long, a joint box or double-pole or triple-pole switch should be used for testing purposes, &c., and on larger installations the ring type of mains is a good idea, and has been found to be very valuable. A main starting from the sub-station is run round the estate and back to the sub-station, with a switch half-way to break the ring, and say, two or three more switches in the ring, as the case may be. In the case of a breakdown only one-third of the system or so, according to the number of switches used, is out of use at a time until all is repaired.

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**A German Congress.**—We are informed from a Continental source that the next International Congress of Mining, Metallurgy, Applied Mechanics, and Practical Geology will be held at Düsseldorf in June, 1910. This is at the invitation of the representatives of the Westphalian mining industry, which was issued at the last Congress, held at Liége in 1905. The programme of proceedings is at present in course of preparation, and will include visits to various institutions and places of interest in and around Düsseldorf, in addition to the usual papers. Any persons interested may obtain further information from the Arbeitsausschus des Internationalen Kongresses Düsseldorf, 1910, Düsseldorf, 15, Jacobistrasse, 3 and 5.

**Peculiar Accident to a Tungsten Lamp.**—Our contemporary, *Electricity*, of Milan, publishes an account of a curious occurrence which happened to an 80-watt tungsten lamp, simultaneously with a flash of lightning which blew the safety fuse. A shock was observed at the lamp, which could not again be lighted up. The glass bulb was pierced by a body evidently directed from the inside; this was obvious from the appearance of the hole in the glass. The metallic filament was broken on every side, and the hole in the glass was apparently made by one of the metallic supports, which must have been projected from its place with considerable force.

# THE ELECTRO-MECHANICAL PROPULSION OF SHIPS.

By A. P. CHALKLEY, B.Sc.

Ever since the steam turbine became an important factor in marine work some years ago, the question of its economical adoption for moderate speed ships has been receiving the attention of engineers, not only in this country, but also on the Continent and in America, and it would be idle to deny that no satisfactory solution has yet been found. The difficulty, in a few words, lies in the fact that the steam turbine must run at a high speed, and the propellers at a low speed of rotation, for good efficiency, and therefore for turbine boats of 20 knots or under, if the turbines are running at their most economical speed, the propellers are proportionally inefficient, and *vice versa*.

In the ordinary direct drive (*i.e.*, with the turbines coupled direct to the propellers) for these boats, a compromise has invariably had to be effected, giving a maximum combined efficiency which is much less than the maximum efficiencies of the turbine and propeller if both are run at their most suitable speeds. The obvious means of remedying this state of affairs is to devise some satisfactory low-speed turbine or an efficient high-speed propeller, neither of which has yet been accomplished, and at present the best results have been obtained by the combination of high-pressure reciprocating engines and low-pressure turbines, driving separate propellers. This arrangement has given an undeniably better steam consumption than the pure turbine drive for intermediate speed boats, but it is naturally heavy and costly, and it is doubtful if it will be widely adopted.

The comparative lack of success of this expedient has led many engineers to turn their attention to the design of a practical means of gearing the propeller and turbine shafts so that the turbine spindle and propeller may each run at its proper speed. Mechanical gear, while not absolutely impossible, has to overcome enormous obstacles, and the only really possible suggestion in this direction is the use of magnetic clutches, in which the teeth are never actually in contact, the magnetic field created by the driving wheel causing the driven wheel (keyed on to the propeller shaft) to revolve without friction. It may safely be said, however, that after prolific experiments on the part of many investors, this idea has been quite abandoned, at any rate for the present.

It is, however, in the electro-mechanical system of propulsion that the greatest hopes are now centred, but it is unfortunate that a considerable bar to its development is due to the fact that marine engineers in general know little of electrical work, while electrical engineers are likewise unacquainted with sea-going conditions.

The broad principle of electric propulsion is as follows:—The prime mover, instead of driving the propeller shaft direct, is coupled to an electric generator, which transmits its power to motors coupled to the propellers, the speed in each case being that for maximum efficiency, the whole arrangement practically consisting of a system of electric gearing. At first sight it might appear as if this would largely increase the weight, cost, and complication of the installation, but, as will subsequently be shown, the exact opposite is the case.

Considering the relative aspects of a moderate speed boat with direct turbine drive, and secondly, with electro-mechanical propulsion, we have, in the first instance, heavy low-speed uneconomical turbines, a large boiler plant, and a great length of propeller shafting, while the "astern" turbines add considerably to the weight and cost, and decrease the efficiency. In the second case, while there are the generators and motors to allow for, the lessened steam consumption due to the higher efficiency of the turbines, which, of course, would run at their most economical speed, the smaller boiler installation, the absence of astern turbines and propeller shafting, and the decreased size of valves, pipes and all auxiliaries, actually would bring about a reduction in cost and weight of the whole equipment. These facts will be elucidated by figures which obtain in practice after some of the systems have been described.

About nine or ten different proposals for the electric propulsion of ships have been brought forward, and many of them patented; two of them have been tried practically, while of the others several designs are now being prepared, so that rapid developments are to be anticipated very shortly. Mr. Parsons, the inventor of the steam turbine, was quick to recognise the unsatisfactory results with intermediate speed turbine boats, and his system of electric propulsion was one of the first, and it should apparently give the highest economy in steam consumption that is possible with any combination. His idea is to combine high-pressure turbines or reciprocating engines with low-pressure turbo-generators, the steam, after passing through the main propelling engines, being delivered to the turbo-generators, which are, of course, quite disconnected from the propeller shafting. The generators deliver their power to electric motors on the propeller shafts, which thus aid the main engines. The hopes for this system are based on the well-known economy of the low-pressure turbine, and it is certain that if it were adapted to existing cargo steamers, by placing turbo-generators between the reciprocating engines and the condensers, and coupling motors to the propeller shafts, the saving in coal consumption would be sufficient to cover the cost of the extra plant in four or five years at the outside. In this arrangement direct current would be used, probably at 200 volts, and series motors would be employed for the drive. To this there are objections, inasmuch as commutators at sea are to be avoided, for there is little doubt that they would cause trouble, and, moreover, since direct-current turbo-generators are unsatisfactory above 1,000 KW., the size of boat to which this system is applicable would not be more than about 5,000 tons. Of course, turbo-generators of 2,000 KW. can be relied upon if two tandem armatures are used, but it is vastly improbable that marine engineers would agree to this arrangement for sea use. The lay-out with this system is not particularly convenient, and the saving in space and weight would by no means be as great as is possible with a purely electrical drive, because the main propelling machinery would be on the same heavy scale as for the direct drive; also the size and cost of the auxiliaries would be only slightly diminished, and the same propeller shafting would still be necessary. The arrangement is shown diagrammatically in fig. 1 in which *a* is the high-speed reciprocating engine from which the

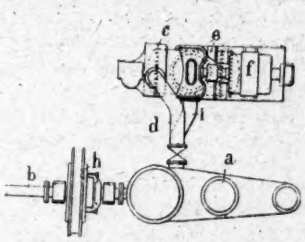


Fig. 1.

exhaust steam is taken by the pipe *d* into the low-pressure turbine *c* driving the dynamo *f*. The current from the generator is delivered to the motor *h*, mounted on the propeller shaft *b*, the controlling switchgear being arranged at any convenient position in the engine room. A point of difficulty which would arise with this system, is the question of the steam pressure at the entrance to the turbine to give the most efficient results, and this is a more complex matter than appears at first sight. Turbine engineers would favour a pressure of at least 15 lb. per sq. in. absolute, and many would advise as high as 30 lb. absolute, and yet for a recently-built ship with direct drive, and a combination of reciprocating engines and low-pressure turbines, the pressure at the turbine stop valve was 10 lb. absolute. It is evident under these conditions that a vacuum of at least 28 in. is essential, and it is feasible that the economy obtained in such ships may be due to the excellence of the condensing plant rather than to the inherent advantages of the system.

A somewhat similar arrangement to the Parsons is that proposed by Messrs. Brown-Boveri, shown in fig. 2, in which the three propellers 1, 2, 3 of a triple-screw boat are driven direct by slow-speed turbines T, $T^1$, $T^2$.

A single and separate high-pressure turbine T³, running at high speed, drives the generator G, from which power is taken to the motors E, E¹, E² on the main propeller shafts. This is, of course, only a minor modification of existing practice, and the gain in economy in ordinary cases would

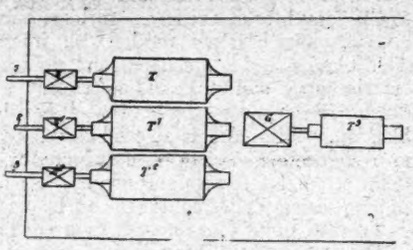

Fig. 2.

not be great, since the inevitable cause of overall inefficiency still remains—*i.e.*, slow-speed turbines coupled direct to the propeller shafts. The chief object, however, in this case is to promote ease of manœuvring and efficiency at cruising speeds, when the motors alone would be utilised to drive the propellers, the rotors of the main propelling turbines revolving idly in their casings.

It is, therefore, to battleships that this system would be most applicable, since the greater part of their existence is spent in steaming at cruising speed, and, moreover, the motors would give an excess of power in emergencies.

Coming, now, to the purely electrical propulsion, the suggestion of Messrs. Siemens, illustrated in fig. 3, was one of the first to be patented, and the fact that so many of the

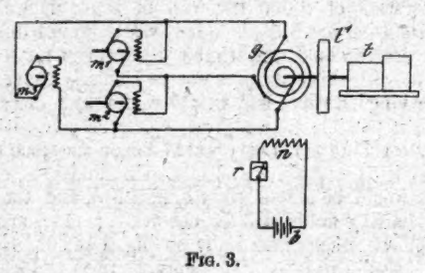

Fig. 3.

great firms and engineers are working on the subject is a sound proof (if one be needed) of its great possibilities. In this arrangement, as might be expected, knowing the faith which Siemens and other German manufacturers place in the commutator motor, alternating-current series motors are proposed.

The high-speed turbine *t* drives a direct-coupled three-phase alternator *g*, and the current from the three phases is used to run three single-phase commutator motors $m^1$, $m^2$, $m^3$, which drive the propellers direct, being placed as near the extreme end of the boat as possible. The excitation for the main generator or generators is provided from a battery *b*, a rheostat *r* being in the field circuit for regulation.

Electrically the system seems very interesting, and there is no doubt that the series alternating-current motor possesses some advantages for marine work, but one cannot help thinking that the designers had little cognisance of general marine work, for it is practically certain that if electric propulsion is to be completely successful on a large scale, commutators will have to be dispensed with. The trouble they cause, even on the comparatively small generators used for lighting and power purposes on ships at the present time, is quite sufficient to prevent marine engineers from employing them on a more extended scale.

A promising and more practical arrangement is that designed by Mr. Mavor, the motor he proposes to employ being shown in fig. 4. The motor consists of three parts—the stator, the rotor, and the spinner, which is mounted on bearings, and is free to revolve between the rotor and the stator, so that the arrangement is virtually a pair of concentric motors, the spinner being the rotor of one and the armature of the other.

The windings of the rotor and the secondary (or outer) of the spinner are both of the squirrel-cage type, while the primary (or inner) of the spinner consists of an ordinary three-phase winding, which, like the stator, receives its current from the generator. The value of this motor lies in the fact that three widely different speeds may be obtained with practically no loss of efficiency, as will be seen from the following description. The spinner in every case simply

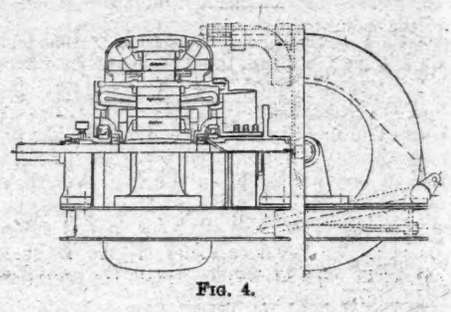

Fig. 4.

revolves without doing work, and the only loss created is the almost negligible amount due to bearing friction. At full speed the spinner and rotor rotate in the same direction, at lowest speed in opposite directions (the change being brought about by means of a reversing switch), and an intermediate speed is obtained by stopping the spinner altogether.

For further variations of speed the generators might be slowed down to some extent, though this is not a means to be adopted when avoidable, especially when steam turbines are the prime movers, though it would not be so disastrous with oil or gas engine plants.

The lay-out for Mr. Mavor's system is excellently planned, after the style of land installations, the turbo-alternators being placed directly over the condenser, and the air pumps (electrically driven) alongside. In fact, the general rules for central station equipment might well be followed in this case.

It may be mentioned that motors of this type are already in operation for some land purposes; probably there is a wide field for them for such work as driving rolling mills, winding engines, &c., though it must be admitted that their relatively large diameter may be disadvantageous in marine work, particularly for shallow draught steamers.

(*To be concluded.*)

## THE STORES DEPARTMENT.

By J. C. PETERSEN, A.C.I.S.,
Chief Clerk and Commercial Assistant, Corporation Electrical Supply Department, South Shields.

Perhaps in many cases this important department is not given the attention and supervision it merits, and therefore it is quite possible that economies could be effected in some cases in this branch of an electricity supply undertaking. It may be no uncommon event to discover, when stocktaking, material in a perished condition, and various articles far in excess of the immediate requirements, whilst others are obsolete, simply owing to the fact that too little attention has been paid at the time of ordering to the probable amount or quantities likely to be used. Therefore, it is necessary to have certain rules with regard to sending in requisitions for stores, &c., and the consequent ordering of the goods and material.

All books relating to the Stores Department should be kept by the clerical staff at the general office, and not by the storekeeper. Suitable slips containing records of all requirements and goods received should be sent in daily by the storekeeper to the general office, for entry into the respective books.

The storekeeper should be provided with a duplicate book for his requirements; one copy will be retained in the book, the other forwarded to the general office; these slips should be filed in numerical order for easy reference. Under no consideration whatever should goods be ordered unless

such a requisition is received from the storekeeper, giving full particulars of the goods and of the quantity required, and stating also the quantity then in stock. No orders should be sent out except through the general office, unless the case is one of extreme urgency, when the requisition should be sent in immediately thereafter, stating thereon the reason why the goods have been ordered direct and not through the general office. The official order should then be forwarded, confirming the order from the stores department. It will thus become known that an official order must be obtained covering all supplies, and in the event of the same not being received in due course, firms supplying goods will soon communicate with the department responsible for the issue of the official order, particularly if the rule is that all order numbers should be quoted on the invoice; thus all goods ordered other than through the general office, if not followed by an official order, will be brought to notice by suppliers, and steps can be taken to prevent a repetition.

A "Requisition Book" should be kept at the general office; this should be on the loose-leaf principle, but need not be an expensive book, one of the cheaper kinds of post binders will suit equally well. All requisitions should be entered therein as received.

Ruling of Requisition Book.

| Date. | No. | Requisitions. | Sent in by. | Stock in hand. | Date order'd | Date received. |
|---|---|---|---|---|---|---|
| | | | | | | |

The quantity of stock in hand shown on the storekeeper's requisition should be entered up in the column provided for that purpose; these items should be daily checked with the stock book. By this means a constant check is kept on the stock, and any deficit is at once discovered, it being then an easier matter to trace such discrepancy than it would be if discovered only at the end of the year when stocktaking. Further, this method tends to prevent the ordering of any undue quantity of material, as on reference to the stock book the usual quantities ordered at one time are observed, also the quantities used over a certain period, and if the amount requisitioned seems large, the matter can be taken up with the storekeeper or the superintendent in whose department the particular stock referred to is employed.

This requisition book, of course, applies not only to stock, but to all requirements.

The official order book, the order forms of which are in duplicate, should be written up daily from the requisition book, and the orders duly signed by the chief official of the department before sending them out.

As the goods are delivered, the storekeeper will send in slips giving full particulars as to quantity, &c., how

Ruling of Day Book.

| Date. | No. of drum or case. | When returned. | Quantity | Description of goods. | From. | Date certified for payment. | How sent. | Stock book page. |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

delivered, and distinctive numbers of drums, packages, or cases; the dates of these slips are then entered up in the "date executed" column in the requisition book, and the slips are copied in detail in the day book, and filed in chronological order. As the orders are completed on each sheet in the requisition book, the sheets should be transferred to the back of the book and placed in numerical order. Thus all orders not executed can be seen at a glance. Orders may be sent out and not thought of again until the goods are required; but with a requisition book as described, all the sheets containing uncompleted orders being in the front of the book and the completed orders at the back, it is only a matter of minutes for a clerk to run over the sheets, see date ordered, and, if necessary, write and ascertain the reason for delay in delivery.

As in many municipal undertakings, personal accounts are not opened in the ledgers for stock purchases, nor is it necessary, owing to the fact that these purchases are more or less of the nature of cash purchases, the accounts being paid monthly; therefore great care should be taken in checking invoices, in order that there may be no possibility of goods being paid for twice. If the following system is adopted it will obviate any chance of such an event, and will, moreover, be a check in other directions, as no doubt the reader will perceive.

The invoices should all be stamped with a rubber stamp similar to the following—

| | |
|---|---|
| *Received* | D. B. |
| *Examined* | O. B. |
| *Certified* | |
| *Date* | |

and first checked with the day book. If the delivery is proved, the date should be written therein in the column "Date certified for payment"; and then the line "Received" on the stamped impression on the invoice should be initialled, and the number of the page of the day book entered thereon. The invoice should next be compared with the official order book, the calculations and prices checked, and, if correct, the line "Examined" should be initialled and the order number be inserted thereafter. The departmental date stamp should then be stamped on the duplicate order, and the invoice be certified by the chief official on the line provided for that purpose, and forwarded to the accountant's department for payment.

If this method is strictly adhered to, the genuineness of the invoice is proved—first, by proof of delivery in the day book; secondly, by reference to the duplicate official order; moreover, as this duplicate is stamped when the invoice is certified for payment, and the column opposite the goods in the day book is marked with the date of certification, it is practically impossible for a mistake to be made and goods certified for payment twice, nor is it possible to pay for goods not received; further, this system leaves open very little scope for fraud.

As before pointed out, it is advisable for all stock books to be kept at the general office. The storekeeper will, of course, receive an order before handing out any stores. This

Ruling of Stores Issued Sheets.

Store Sheet.

..... Department. Week ending ..... 190 .

| | W.O. | Rate. | Amount. | | W.O. | Rate. | Amount. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

he will enter on the "Stores issued sheet," together with the works order, which will appear on his order. He may use one column for engine oil, another for cylinder oil, and so on, retaining one column for sundries; the sheets for the inside and outside departments are kept separate, the department they appertain to being marked on each sheet. The rate and cash columns will be dealt with at the general office. The superintendents will sign each sheet referring to

their respective departments, and the sheets should be sent in weekly to the general office, together with the orders. A clerk will then check the sheets with the orders, thus proving that nothing on the sheets has been issued from the stores without an order signed by the superintendent interested or other responsible official.

*The Stock Book.*—The "loose-leaf" is undoubtedly the class of book that should be used for this purpose. Its advantages over the fast-leaf book are briefly: no indexing required; sheets arranged in alphabetical order; accounts always in the same order, no transferring when sheets are full; quantities used over corresponding periods can be seen at a glance. This book is also preferable to the card system of stock-keeping, as the cards have to be taken out of the tray for each entry and then re-inserted; moreover, the tray is cumbersome when in use on a desk, the book being certainly more convenient for handling.

Ruling of Stock Book.

Minimum amount

| Date. | D B. Page | Received. | Rate. | Amount. | Date. | Issued. | Rate. | Amount. |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

It will be noticed that each account has a cash column, and the reason for this in a quantities record book is that as the same classes of material or stores are often purchased at different prices, for instance, on the expiration of a contract, it is difficult without the aid of this column for the clerk

Ruling of Meter Stock Card.

Meter number Size Voltage
Make
Date received into stock

| Date issued. | Index. | To | Date returned. | Index. |
|---|---|---|---|---|
| | | | | |

Reverse Side.

| Installed dates. | ..... | ..... | ..... | ..... | ..... | ..... |
|---|---|---|---|---|---|---|
| Tests. ..... ..... ..... By | | | | | | |
| Returned dates. | ..... | ..... | ..... | ..... | ..... | ..... |
| Tests. ..... ..... ..... By | | | | | | |

to know what quantity should be booked out at the various prices. The clerk pricing out the "stores issued sheets," sees from the stock book the quantity to be issued at a certain rate; thus, when the "stores ledger" is posted from the stores issued sheets, the correct value of the goods or material is entered, and the stock in hand shown by the stores ledger will agree with aggregate balances of the stock book.

With regard to the meter register, there is no doubt in this particular instance that the card tray system is the best, as, owing to the constant change of meters, it has been found that a book soon gets, more or less, into a complicated state, whereas with the card tray all particular makes of meters can be kept together, according to their sizes, and also in numerical order. The following is a brief description of the method:—The tray should be divided into two portions by the aid of guide cards, one for meters issued, the other for meters in stock; each of these divisions should be further sub divided into the different sizes by suitable guide cards, and divided again by further guides, according to their respective makes. The meters should then be arranged in numerical order, according to the maker's number. Of course the numbers will not run in consecutive order, but if cards are filed with, say, the smallest number first and so on, any particular number can be easily referred to.

These cards will record the history of any particular meter since its purchase, and not only answer for the purpose of a stock account, but also contain records of tests and records of return and re-issue.

*Stocktaking.*—After this has been duly taken, an important item is the adjustment of each stock account where necessary. When comparing the actual stock with the book stock, an account of all excess issues should be taken; the value of these items should be debited to stock account, and credited to the account or accounts the material is usually charged to, and deficits of stock should be debited to the account usually charged to and credited to the stock account. The excess issues or deficits should then be adjusted in the stock book, the accounts balanced, and the balances carried forward. Thus at the commencement of the new year the stock book will show the actual amount of stock in hand on each account, and the aggregate value of the same will agree with the total amount returned as "Stock in hand."

**The German Lamp Taxes.**—The Reichstag has adopted by 185 to 160 votes, on first reading, the proposal to levy taxes on gas and electric lamps. A petition presented against the scheme by the Society for the Protection of the Economic Interests of German Electrical Engineering, points out that the tax on arc lamp carbons amounts to 8½d. per kilogramme on carbons not exceeding the price of 1s. 6d. per kilogramme, and to 1s. 2½d. per kilogramme for all others. In the opinion of the society this represents a favouring of glow lamps. The tax on incandescent gas lamps is to be 1½d. each, and on electric glow lamps of from 100 to 200 watts consumption, 6d. each, with 3d. extra for every additional 100 watts or portion thereof. On this basis a light of 500 candles and 1,000 hours' duration would be taxed to the extent of 1s. 6d. in the case of incandescent gas lamps, 1s. 3d. in that of electric glow lamps, and 5s. in that of arc lamps. With a light of 1,000 candles and 1,000 hours, the tax would be 3s. on incandescent gas lamps, 2s. 6d. on electric glow lamps, and 8s. on arc lamps with pure carbons, and 10s. 7d. with "effect" carbons; and a light of 2,000 candles for the same number of hours would involve a tax of 6s. for gas, 5s. for electric glow lamps, and 11s. 7d. for arc lamps with pure carbons, and 11s. 6d. with "effect" carbons. These figures, in the view of the society, show that arc lighting in Germany will be rendered impossible from an economic standpoint, thus causing severe prejudice to the carbon-making industry. In order, however, to prevent this injury as far as possible, the society suggested that a differentiation should be made between pure carbons and "effect" carbons, the former to be taxed at 2½d. and the latter at 7½d. per kilogramme. The society also proposes that taxation should be effected on the basis of the book-keeping. This would be readily possible, as at present there are only 5 arc-lamp factories in Germany, and 30 glow-lamp factories, all of which keep their books on a strictly commercial basis. The number of Government officials to control the taxation and the incidental expenses would be considerably reduced by the adoption of the manufacturing and sales books as the basis, and in this way, the society concludes, the deficiency in revenue arising from the differentiation between the two classes of carbons, instead of differentiation between the sale prices of the maker, would be recouped. During the discussion in the Reichstag before the first reading of the Bill was carried, one of the members stated that the Siemens & Halske Co. delivered 60,000 glow lamps daily; that the supervision of these lamps, from the point of view of candle-power in watts, would require 100 Inland Revenue officials in these works alone; and that the shipping companies would procure their supplies of lamps from England if the taxes were imposed.

## COST OF LIVING IN CHILE.

By C. A. SMITH, A.Am.I.E.E.

Under this heading, it is believed that some reliable information concerning the climate, the cost of living and life in Chile, would be of interest to some of the readers of the Electrical Review.

When one turns up his map of South America, and looks at this strip of territory, narrow out of proportion to its length, one marvels at its curious shape; as it reaches from Cape Horn to Peru, through 38° of latitude, for a distance of about 4,250 km., while not exceeding 300 km. in width. Being bounded on the east by the lofty and often snow-clad Andes, and on the west by the breezy Pacific Ocean, one can well understand why there are such decided differences in aspect and climate.

On the whole, the climate of Chile is temperate, but there are local seasonal exceptions. The proficient engineer with plenty of grit, wishing to try his luck in Chile, will have splendid opportunities with plenty of variety, but he must not attempt it on "spec." If sent, maybe, by some nitrate firm, mining company, or, perhaps, for a railway scheme, he must not become disheartened to find himself in the North on the *pampa*, where it never rains and no blade of grass grows, and there is only desert and little else but one's own company. The climate here is considered temperate (20° C. summer maximum and 14° C. winter minimum). If he goes further into the interior where the country is more elevated, greater heat and cold will be experienced, as the thermometer may stand at 55° C. in the sun in the morning, and at zero at night. Or, perhaps, he may go up into the mountains some 2,000 metres or more above sea level, which is generally to the taste of those who like a rough free life.

As a contrast, in the Southern provinces the country is all green, as the rainfall is heavy; in Valdivia, for instance, it rains one-third of the year. Going still further south to the Straits of Magellan, a promising mining district, the country round is covered with snow through June and July, and the weather generally very cold.

In the Central Provinces where the largest towns are situated, and where there are extensive agricultural, wine-growing and copper-mining interests, the climate is delightful.

It is assumed that the interested persons are men sent out on a three or five years' agreement to take up responsible positions. In the first place, it is understood that no one would be so foolish as to accept terms other than upon a sterling basis, because the Chilian currency is for ever varying in value, and has during recent years suffered considerable declination. At the present time the sterling equivalent of the *peso* is 10d., and upon this value the following items are based.

In the second place, it is not advisable for a single man to accept a lower commencing salary than £250 per annum, while it should be mentioned that most of the men known to the writer earn from £300 and upwards, and in the case of managers and chief engineers, most of whom are married, these receive £500 and above. The values assigned to salaries, however, will vary with the locality; for example, in the north where life is trying and monotonous, and cost of living much higher, or again in the extreme south where it is disagreeably cold, higher salaries should be expected than for the central parts of the country where living is cheaper and life more enjoyable.

In considering the case of a married, man who would search for a comfortable house, nine times out of ten he would not find one suitable to his taste and pocket, as the majority of houses are too large and highly rented. For houses of similar sizes, the rents in Santiago and Valparaiso are twice what they would be in London, and with many discomforts thrown in. It may be taken, however, that for a six-roomed house or flat in Santiago or Valparaiso, the rent is from $140 to $350 per month, and Iquique or Concepcion $120 to $200, according to locality.

Board and lodgings for a bachelor living either with a family, or with chums, runs from $120 to $200 per month; this will include a light breakfast, lunch at mid-day, and dinner in the evening. Of course, wines and spirits are extra. Living in a hotel, which is generally considered only a temporary expedient, costs from $8 to $25 per day, but if for an extended period, less.

A good brand of whisky costs about $78, and Chilian wines $10 to $18 the case; one pays 30 cents for a half-bottle of native beer. Havana cigars range from $40 to $85 per hundred, while English imported tobacco costs $12·50 to $16 the lb.

Generally speaking, one wears the same kind of clothing as at home, excepting, perhaps, additional thinner summer suits, &c., and those residing in the cities find it convenient to have a smoker or swallow-tail for social occasions. A warm overcoat will be appreciated on winter evenings, and a soaking rain-proof coat for wet weather. The natives, when riding on horseback, use a *manta* for warmth or a *poncho* for wet weather; both of these garments are obtainable here.

Clothing is dear in Chile, and at the present rate of exchange a suit may cost anything from $130 to $230, according to the locality and tailor. A pair of imported boots will cost from $35 to $42, while the native article (of variable quality) will cost $25 to $35. Heavy boots for Chile are a mistaken idea.

Imported hats are also dear, a bowler costing $20 to $28 and a straw brimmer about $10. Shirts will run to from $50 to $60 the half-dozen, while collars reach $20 to $26 the dozen.

Doctors' fees are $5 in the consulting room, and when called, $10 per visit. It is advisable to be vaccinated before coming to the country, as small-pox is generally prevalent.

One's washing account may range from $10 to $20 per month.

Domestic servants, who are usually looked upon as a necessary evil, earn from $25 to $35 per month (the much-abused maid-of-all-work is not known here), and do as little as possible for it.

There is an English Social Club in most of the principal towns (the entrance fees being about $100 and subscriptions equivalent to $96 or $120 per annum), also the usual athletic clubs. One can have plenty of shooting and horse riding, the last-mentioned sport being the most indulged in, as it affords a splendid opportunity for knowing the country, and in many instances forms the only means of locomotion, the country roads being often impassable to wheel traffic. The price of a decent horse ranges from $200 to $400, and the keep $40 to $60 per month, while a good English saddle costs $250.

Travelling by rail is comfortable, and one-third the price of travelling in England when considering first-class in each case. One never travels second-class, while third is unmentionable.

It will be interesting to add that the old sea trip from Liverpool to Valparaiso *via* Straits of Magellan is about 9,600 miles, and usually takes five weeks; a first-class passage costs £65, and second-class, £30. A much quicker and cheaper route is *via* Buenos Ayres and thence over The Andes by train, which will see one through the journey in 24 days, and cost £52 10s.—viz., sea passage £39 and £13 10s. first-class fare over the mountains. This route, however, is only open to traffic from the beginning of October to about the middle of May. In taking this picturesque trip the traveller is carried over the *cumbre* of the cordilleras, 3,900 metres above sea level; 50 kilos is the free luggage allowance with an excess charge of $6.30 for every 5 kilos or fraction thereof.

Another convenient route is *via* Panama and the United States, the trip from New York to Valparaiso costing £55 17s., and takes 19 days.

Chile is very cosmopolitan, and as soon as the home sickness has worn off the new-comer quickly settles down to enjoy an easier and freer life than at home; it is advisable at first to live with a native family for a while, so as to learn their language, which is essentially Spanish, and easily mastered.

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**Prosecution.**—A band of Aberdeen youths has been heavily fined for placing a piece of wire round the telegraph wires between Aberdeen and Ballater, causing a delay and interruption for about 50 minutes.

## PROCEEDINGS OF INSTITUTIONS.

### The Electrification of Steam-Driven Non-Reversing Rolling Mills.

By W. F. MYLAN, A.M.I.E.E.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS *at Leeds, May 5th*, 1909.)

IT is estimated that in Europe at the present date there are upwards of 230 electrically-driven non-reversing mills in operation, the horse-power of the motors used exceeding a total of 200,000 H.P.

A large number of elect ically-driven rolling mills are in commercial operation in this country, giving every satisfaction to the proprietors and justifying their conversion. As a consequence, and following on the data obtained from actual installations, the electric driving of rolling mills is now quite past the experimental stage, and it is not only possible to estimate with certainty the size and every feature of an equipment, but to dete mine very closely the actual cost of operating under any stated conditions.

In estimating for the electrical equipment of an existing steam-driven mill it is usual to take a series of continuous indicator diagrams of the engine, the mill for the time doing its hardest work. Care must be taken not to place too great a reliance on the horse-powers as calculated from such diagrams. Allowance must be made for the increased output and heavier duty required of the motor, and it is better to estimate the horse-power of the motor by calculating the work it will be called upon to do from the data already obtained under the same or similar conditions.

A properly designed fly-wheel is of great assistance in reducing the size of the motor and enabling it to get over the peak loads without absorbing too great a current from the line.

The time taken to extract the energy from the fly-wheel is usually considerably shorter than the time required to return the same amount of energy to it, assuming that it is desired to maintain the demand from the line as nearly constant as possible. In the perfect case the light-load period is equal to or greater than the overload period. The use of a fly-wheel for levelling the output demanded of the motor is not generally practicable if the time in rolling one pass exceeds about 30 sec., and in such cases the introduction of a heavy fly-wheel would be open to very serious objections, inasmuch as the motor would, after a certain point in the pass, have to pull the fly-wheel round in addition to supplying the power required for rolling. This is the case in rolling long bars, rails, &c., and here a comparatively light fly-wheel is desirable, levelling only the smaller peaks and variations in the load, the motor being designed to deal with the main peaks without any external assistance.

In those cases where a heavy fly-wheel is employed with the object of relieving the strain on the motor it is usual to employ an automatic device to ensure that the fly-wheel carries its fair share of the load. With direct-current machines the motors are always compounded, but to further increase the strength of the field use is made of a separate excitation, which increases the field current, so reducing the speed still further and obtaining a return of the fly-wheel energy during the correct period. With alternating equipment a slip regulator is employed, automatically introducing a resistance in the rotor circuit at times of heavy load; the resulting effect, however, is the same and is independent of the electrical characteristics of the installation. As a general rule it can be stated that, with a properly designed fly-wheel, the fluctuations of load are only one-half of what they would be were the fly-wheel effect not utilised.

The proper place for the fly-wheel is, of course, on the highest running shaft; but this is not usually feasible, and consequently it is generally found that the fly-wheel is fitted on a motion direct geared to the mill, thus preventing the extra strain on the motor and its gears or ropes.

Fly-wheel equalisers are occasionally employed to level up the demands on the power supply, but these are open to the same limitation as the direct use of a fly-wheel, and necessitate the motor being made large enough to deal with the maximum overload.

In merchant mills it is an advantage and practically a necessity to be able to vary the speed of the mill motor. With a D.C. power supply this is a comparatively simple matter, the speed variation being obtained by means of field regulation only. The only practical way of reducing the speed of an A.C. motor is either by the introduction of resistance into the rotor circuit, or by choosing a suitable number of poles to run at two or three speeds with economy. In the first case, speed reduction is obtained by means of, usually, a liquid type of controller, and over a very wide range, but with serious loss in efficiency; in the second case, a special controller grouping the stator windings in a suitable manner will give only two, or at the most three speeds, but give them with an efficiency only a few per cent. below the maximum. An attempt has been made to overcome the difficulty by adopting in cases where a speed reduction is desired a device in which the motor shaft carries a three-step rope pulley, and the necessary lengthened shaft is supported at its free end by a pedestal bearing, the whole being carried on a base plate mounted on slide rails. In the event of a different speed being desired, the motor bedplate is slacked back, the ropes are changed to the desired group of pulleys, and the motor is drawn back to tighten up the ropes. In order to carry this alteration through in the minimum possible time, a small motor is usually fitted to operate the sliding baseplate screws, and under such conditions it is remarkable what a short space of time is required to make a change. In an installation of this character the men are accustomed to make the change in some three or four minutes, this time representing the period under normal circumstances and without any special effort.

In the large majority of cases it is impossible to direct-couple the motor to the mill, and some form of speed reduction is essential. Where the motor can be direct coupled it is advisable, with the view of reducing the sudden shocks and strains on the motor, to introduce a flexible coupling. Ropes have the same effect as the flexible coupling in the case of the direct-coupled motor. The bearings of motors used in rolling-mill work should be of more massive construction than is usual, and thoroughly well lubricated.

Owing to the heavy and frequent overloads that the motor must deal with, the shaft must be stiffened and the end windings of the motor properly braced to prevent distortion. Where slip-ring motors are employed, the rings should be of ample section. Occasionally one meets motors where the smallness of the rings has a serious effect in very much reducing the overload capacity of the motor, owing to the smallness of the rotor currents which can be dealt with without excessive sparking and heating at the rings.

A great feature of any electrical equipment is the ease and absolute certainty with which the control of the motor is effected. The provision of a suitable outfit of recording instruments is to be recommended. Such an outfit should consist of a recording ammeter or wattmeter, showing the momentary fluctuations in the load on the motor, and an integrating wattmeter totalling up the power taken over a certain period. By keeping a correct log of these data it is easy to determine accurately the cost of rolling each particular section. A circuit-breaker should always be provided in the main circuit of the motor, with overload and no-volt release. The provision of a no-volt release is important, as this allows of the fitting of emergency switches, allowing the mill to be quickly stopped in case of necessity from any of several points. These switches open-circuit the no-volt release coil of the breaker, thus opening the breaker and cutting off the supply of current from the motor. For starting large motors, from all points of view a liquid controller is to be recommended. Large controllers of this pattern are usually fitted with cooling coils, the consumption of water for this purpose being about 3·3 gallons per hour per horse-power dissipated. For the best results the temperature of the resistance liquid should be between 60° C. and 80° C.

The following figures represent the actual ascertained consumption from certain mills, as determined by careful calculation and observation made over a long period:—

Re-rolling 90-lb. rails of section 16 lb. per yard, each piece 30 ft. long, required 56 units per piece. Total output of mill 4,800 pieces per 12 hours. Small mining rails rolled from billets 5 in. × 5$\frac{3}{4}$ in. and weighing from 900 lb. in the case of 28 lb. per yard rail to an average of 650 in the case of 18-lb. rails required as follows per ton rolled: 28 lb., 38 units; 24 lb., 42 units; 20 lb., 45 units; 18 lb., 48 units. Smaller rails of 12-lb. and 8-lb. section require from 49 to 54 units per ton rolled.

Girders 11 in. × 6 in. can be rolled for about 50 units per ton.

Channels averaging 1$\frac{1}{2}$ in. × $\frac{3}{4}$ in. × 2 in. require 66 units.

Angles 3$\frac{1}{2}$ in. × 3$\frac{1}{2}$ in. × $\frac{5}{8}$ in. from 800-lb. billets require 50 units.

| | | | | | |
|---|---|---|---|---|---|
| Sheets (iron) | 8 ft. 3 in. | × 33 in. | × 0·064 in., | 95 units | per ton. |
| | 8 „ 0 „ | × 48 „ | × 0·080 „ | 70 „ | „ |
| | 10 „ 0 „ | × 48 „ | × 0·067 „ | 80 „ | „ |
| | 10 „ 0 „ | × 48 „ | × 0·125 „ | 60 „ | „ |
| | 9 „ 6 „ | × 42 „ | × 0·09 „ | 84 „ | „ |

Breaking down 10 in. × 1 in. × 12 ft. brass ingots into strip about No. 8 gauge, 86 units per ton.

Rounds and squares: $\frac{7}{8}$-in. rounds can be rolled at between 40 and 36 units per ton. The mill output is between 22 and 30 tons per shift. Average billet, 28 in. × 4$\frac{1}{2}$ in. × 4$\frac{1}{2}$ in.

1$\frac{1}{16}$-in. round bars required same power. Output of mill, 46 tons per shift.

Bars 1·2 in. and 1·7 in. diameter from billets 5 in. square require 38 and 40 units per ton. In this case the 1·7 in. bars were much shorter than the 1·2 in. bars, and consequently the consumption appears high.

As the torque exerted by the electric motor is maintained absolutely constant at a predetermined value and is quite independent of the momentary position of the motor, it is possible to run the mill at a considerably higher speed than formerly, and a better product with more uniform finish results. In one instance the speed of the mill has been twice increased without any difficulty being met with in handling the material. In rolling at the increased speed, it is found that though the speed is higher the rolls run more evenly, and the material coming away at a steady speed is quite easily caught and controlled when leaving the rolls. After a short time the men get accustomed to handling the product at the higher speed, and if on piecework prefer it, as enabling them to earn more money in the shorter time.

Due to this constant turning effort of a motor as compared with that exerted by a one or two-crank steam or gas engine, the electrically operated mills are very free from stalling; when a tendency to stall does occur, the motor slows down, and extra energy is obtained from the fly-wheel and from the line, automatically tending to get the material through the rolls.

The efficiency of the electrically operated mill estimated from the actual cost of rolling as compared with steam-driven mills is beyond dispute. In this connection it should be borne in mind that the actual decreased power costs in rolling are not due so much to the fact that it is an electric motor doing the work, but that the electric motor enables one either to purchase power at low rates from one of numerous supply companies who operate in all large industrial centres, thus shutting down the wasteful steam

boilers and local electric plant, or, in the case of a number of mills, to concentrate the power plant at one spot, generate in bulk at the lowest possible cost, and distribute the power to the exact points required, with an economy unapproachable by any other system.

The extreme simplicity of the control, and the ease with which it is possible to make electrical apparatus practically fool-proof, reduce the labour costs considerably, and this, coupled with the impossibility of an electrically-driven mill racing, renders less frequent the stoppages for broken couplings, pinions and rolls. Such troubles are inseparable from a stream-driven mill, and are a constant source of annoyance, as well as a big loss, not only due to increased upkeep but to time lost by the mill having to stand whilst the repairs are carried out.

A very material saving in floor space is certain where a mill is converted to electricity, and this is a great advantage, as it enables the space around the mill to be used for the more rapid handling of the material required to feed the mill, and for the disposal of the finished product. Very often the motor can with advantage be installed below the floor level, the only gear on the shop floor being the comparatively insignificant control gear.

An electrically-operated mill has, in any case, less stand-by losses, and in the case of the motor fed from a supply company's main, none at all. In comparing the cost of rolling under the two systems (steam and electricity) this point is important, as in one case the losses are very serious and add largely to the total cost of rolling a certain output.

Where a motor is employed for driving a mill, a great advantage accrues through being able to start up immediately, and a further reduction in cost of rolling is obtained through less labour being required to handle the same material. A motor requires only intermittent attention, and with emergency devices for stopping, it is not necessary to have an attendant standing by continually.

Finally, on the question of capital cost, which, as in all engineering problems, has to be considered, speaking generally the actual electrical equipment of a rolling mill is at the worst only equal to, and in the majority of cases considerably cheaper than, the corresponding steam equipment. If, however, electrification involves either the putting down of generating plant or the extension of an existing plant, then there is no question that the electrification of the mill will entail the expenditure of a larger sum of money than that involved by putting down a new steam plant, and in such cases one must look in other directions to justify the conversion. Usually in any works having a rolling mill there are a great number of auxiliaries on which the existing drive can, with considerable economy, be replaced by introducing the use of a motor, and it is the extra and more even load due to these motors that will justify the installing of generating plant of capacity sufficient to carry the load on the mill and in addition that due to the auxiliaries. It would be impossible to run a plant feeding one mill only, and to generate with economy, unless some other load less variable was also to be obtained, and consequently in such a case it is necessary to consider the broader scheme if any benefit from the electrification is desired. In the case of the works where plant is already installed, and a comparatively cheap extension is all that is necessary, the problem is much simpler, and there is no difficulty in making out an excellent case for electrification.

Supply companies in many areas are a ready source of power. In one instance, with power at 0·85 per kilowatt-hour, a saving of over £3,000 was made on one year's working, more than paying for the cost of the equipment. The crux of the whole question of rolling electrically is whether or not a reasonably cheap source of power is obtainable either from a private generating station or from an outside source, and this obtained, electrical rolling will be found to be considerably cheaper than steam.

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MR. WILSON HARTNELL, in opening the discussion, said that the economies shown were not solely due to the electric drive—some had arisen from its replacing steam gear that was rather antiquated. The ropes used were convenient, but involved a loss of, say, 7½ per cent. of power. Cut geared wheels were now obtainable of large size. The capital to be sunk to drive rolls by electric motors was much less than that required for a steam plant; steam plant for directly driving reversing rolling mills was especially costly. As an instance, an engine at Sheffield of 8,000 H.P., with three cylinders, made only a few revolutions backward and forward each time an ingot of steel was rolled.

MR. C. A. ADLETT thought that Mr. Mylan had rather underestimated the number of rolling mills which were driven electrically on the Continent of Europe; one firm alone had installed nearly 200 motors for driving non-reversing rolling mills, the aggregate power being nearly 200,000 H.P., and he believed that the total number of non-reversing rolling mills on the Continent of Europe which were electrically driven came to nearly 400. In the case of a large reversing rolling mill which was being built for a plant near Middlesbrough, the mill motor would give about 10,000 H.P. under normal conditions of operation, and was supplied by a fly-wheel converter set; as this fly-wheel served to neutralise the variations in load, the motor which drove the fly-wheel converter set had a capacity of only 1,800 H.P., and under normal conditions would take considerably less power than this from the power house. With regard to economy, a large electrically-driven reversing rolling mill had recently been set to work in Germany, where the motor was capable of giving 10,000 H.P. at 30 R.P.M.; this was, he believed, the largest reversing rolling mill motor in the world. The firm who owned this mill stated that the adoption of the electrical drive had saved them 1s. in the ton rolled over the previous steam engine, and had enabled the output to be increased 30 per cent. With reference to the figures given, when the units per ton rolled for a given section were stated, the elongation should also be stated, as when the section was rolled from a large billet the power taken was naturally more than when it was rolled from a small one. In the case of the 9 ft. 6 in. × 43-in. sheets, he could supply the size of the billets, which were 7·9 in. square, weighing 388 lb. each. Referring to the slip regulator employed with an alternating equipment, the speed of the motor must fall by some value up to 10 per cent. in order that the fly-wheel effect might be beneficially utilised, and while this fall in speed could be attained with the compound-wound motor without any loss of power, in the three-phase motor a loss was necessarily involved. It was sometimes stated that the use of the automatic slip regulator enabled the losses which occurred in the slip resistance of a three-phase motor to be reduced, but practical experience had shown that no appreciable reduction could be effected. He was entirely in agreement with the author as to the desirability of using liquid controllers for starting three-phase motors, but if a liquid controller were used with a large direct-current motor, considerable trouble would occur, due to the electrolysis of the plates and of the liquid.

MR. A. J. CRIDGE said that a mill motor supplied from the Sheffield Corporation's mains was of 350 H.P., 2,000 volts, two-phase, 50 periods, running at 490 R.P.M. The motor drove three sets of rolls, two by rope and one by belt transmission. A 4-ft. pulley on the motor was belted to a 10-ft. pulley on the 8-in. mill, and a 4 ft. 6 in. pulley was roped to a 14-ft. pulley on the two 10-in. mills. Roughly, 30 to 40 tons of ingots of various sizes passed through the mill daily, with an average consumption of 1,000 or 1,100 units per day, so that the energy used worked out at from 25 to 30 units per ton.

MR. E. S. SAUNDERS said that direct driving was the most efficient way to drive a mill, and need not necessarily involve extra capital cost. Referring to emergency devices for stopping, there was a case in Sheffield where a steam-driven mill was working, which was fitted up lavishly with these devices. One day the engine commenced to gain speed, eventually running away and bursting its fly-wheel, with disastrous results. Not one single man had the common sense to use the emergency stops. Such an occurrence could easily be guarded against with electrical drives by means of automatic circuit-breakers.

MR. T. HARDING CHURTON said the relative advantages of direct drive, and driving through gear, were mainly a question of expense. In the case of driving by gear, a relatively high-speed motor might be employed, which was both more efficient in running and less expensive in capital outlay. Against these advantages had to be set the power lost in the gear, but this might be entirely balanced by the difference in the relative efficiencies of the high-speed and low-speed motors. The question depended partly on the price paid per unit for the power, and upon the load factor of the machine. As to the efficiency of rope driving, he was inclined to think that the 7½ per cent. loss that had been mentioned was higher than it should be for a well-designed drive. He noticed that the three-phase induction motors mentioned in the paper were all of the wound-rotor type, whereas, in his opinion, the machine with the short-circuited rotor was pre-eminently suitable for this kind of work wherever the heavy starting current would not seriously affect the voltage of the supply. He knew of motors of this type of 50 to 60 H.P. being used for this purpose, connected to power companies' mains, and giving satisfactory results.

MR. H. E. YERBURY asked why there were only three direct-current motor installations, and 26 two and three-phase systems mentioned in the table.

MR. W. F. MYLAN, in reply, said that the use of direct-coupled motors was not entirely a question of capital expenditure. Under certain conditions it was practically impossible for the manufacturer—at any rate, at the present time—to build a satisfactory low-speed A.C. motor, the large number of poles necessitating a very large diameter and a very narrow machine, with a low efficiency and a very bad power factor. It was far better to sacrifice a little in efficiency and to use a high-speed motor and gear, than to lose in the power end due to the efficiency and through extra loss in the line, which was introduced by having a motor with a low power factor. Manufacturers had not introduced a motor of low speed and having a really good power factor and efficiency. In Sheffield the supply authorities refused to allow a motor whose power factor was below their standard to be connected at all. In the case of a motor for direct coupling there was a great difficulty in getting the makers to give a motor which would have a power factor within the limits prescribed—namely, 80 per cent. or more on full load. The speed was about 200 R.P.M., and the horse-power about 70. Even at this comparatively high speed it was impossible to get the manufacturer to guarantee absolutely that it would give a power factor approaching 80 per cent. In the case of direct-current motors, this objection did not hold good. If they were prepared to pay the price they could get a motor of any speed and with good electric and mechanical characteristics. The subject of waste heat was receiving much attention in some quarters, especially at Newcastle.

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**Marvels of Magnetism.**—In the *Dublin Evening Telegraph* of the 10th inst., there appeared illustrations, in connection with an article on the electromagnet, showing magnets lifting hot iron, and "lead refuse." It is true that hot iron can be lifted if not too hot, but there are limits even to the capabilities of the electromagnet, and we thought that everyone knew that magnets had no dealings with lead.

## FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

EGYPT.—Electrical and similar materials pay a duty of 8 per cent. *ad valorem*. The value on which duty is calculated is the value of the goods at the port of entry in Egypt.

ERYTHREA.—A written declaration, in Italian, must be presented for all goods imported. This declaration must contain the surname and Christian name of the consignee or his representative, the place from which the goods proceed, the number and kind of the packages with their marks and numbers, the description of the goods for each package, with indication of the quality and quantity, and this latter must be given both in figures and letters. The duty on electrical and similar goods is 8 per cent. *ad valorem*. The value taken is the value of the goods in the country of origin, increased by all expenses incurred up to the arrival of the goods at the port of Massowah.

ETHIOPIA (ABYSSINIA).—A duty of 10 per cent. *ad valorem* is levied on goods imported into Ethiopia. This duty is levied on the cost price of the goods at the place of origin or manufacture as appearing in the declaration for the Customs, with the addition of freight, insurance and commission necessary for the importation of the goods as far as the place of introduction.

FALKLAND ISLANDS.—Electrical and similar goods are admitted free of duty. No person may use or establish any apparatus or installation in connection with wireless telegraphy without a licence from the Governor.

FIJI ISLANDS.—The following are free of duty:—Iron and steel rails and fishplates, switches, crossings, turntables and parts thereof, and bolts and nuts imported with and belonging to the same; electrical machinery; steam engines, oil engines and boilers; steel railway sleepers; water and wind motors; articles imported as the property of and for the use of the Pacific Cable Board on allowance by the Governor in Council; plain wire, black and galvanised.

The following duties are payable:—

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| Galvanised iron in bars, hoops, rods, sheets, or corrugated ... ... ... ... ... | £3 per ton. |
| Iron, black, in bar, hoop, rod, sheets or plates ... | £1 10s. per ton. |
| Iron, pig and scrap ... ... ... ... | £1 per ton. |
| Oils (not kerosene) ... ... ... ... ... | 9d. per gallon. |
| „ in bottle ... ... ... ... ... | 12½ % ad val. |
| Resin ... ... ... ... ... ... | 2s. per cwt. |
| Steel ... ... ... ... ... ... ... | 12½ % ad val. |
| Wire rope ... ... ... ... ... ... | £3 per ton. |
| Articles not specially mentioned in the tariff ... | 12½ % ad val. |

No person may use or establish any apparatus or installation for the purpose of electrical communication by wireless telegraphy without a licence from the Governor.

## NEW PATENTS APPLIED FOR, 1909.

**Compiled expressly for this journal by W. P. THOMPSON & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.**

15,578. "Improvements in or relating to electric switches." J. A. KENNEDY. McGREGOR. July 5th.

15,580. "Improvements connected with the attachment of telegraph and similar line wires to insulators." W. E. BANDFIELD. July 5th.

15,605. "Improvements in electric arc lamps." SIEMENS SCHUCKERTWERKE G.m.b.H. (Date applied for under Sec. 91 of the Act, July 6th, 1908, being date of application in Germany.) July 5th. (Complete.)

15,647. "Improvements in and relating to the manufacture of electric carbons." R. LESSING. July 5th.

15,650. Improvements in electrical indicators." Hon. S. P. BOUVERIE and W. R. RAWLINGS. July 5th.

15,670. "Improvements in and relating to electrical and other recording and measuring instruments." E. S. HEURTLEY. July 6th.

15,672. "Improvements in apparatus for controlling and operating the points of electric railways and tramways." A. LUSTGARTEN. July 6th.

15,681. "Improvements in electric switches." B. THOMAS and E. THOMAS. July 6th.

15,682. "Improvements in electric collectors." B. THOMAS and E. THOMAS. July 6th.

15,714. "Improvements in electrical water level indicators." THE HON. S. P. BOUVERIE and W. R. RAWLINGS. July 6th.

15,737. "Improved method of securing metal contacts to carbon electrodes." S. BENKO. (Date applied for under Rule 13, December 28th, 1908. An invention comprised in application No. 28,290, dated December 28th, 1908.) July 6th. (Complete.)

15,771. "Improvements in dynamo-electric machinery." A. H. MIDGLEY and C. A. VANDERVELL. July 6th.

15,795. "New or improved protector for insulators on telegraph or telephone posts and the like." F. STEVENS. July 6th.

15,800. "Improved continuous-current dynamo-electric machine." R. WALLWORK, C. H. WALLWORK and B. J. SHILLITO. July 7th.

15,802. "Improvements in or relating to electric ignition apparatus for internal combustion engines." B. BROOKS and F. H. ALSTON. July 7th.

15,803. "Improvements in or relating to the electric ignition systems of internal combustion engines." B. BROOKS and F. H. ALSTON. July 7th.

15,854. "Improvements in electrical mercury switches operated by a vehicle passing along a railway." SIEMENS BROS. & Co., LTD., and L. DE M. G. FERREIRA. July 7th. (Complete.)

15,862. "Improvements in electrical block signalling systems." E. A. RICHARDSON. (Date applied for under Sec. 91 of the Act, July 11th, 1908, being date of application in France.) July 7th. (Complete.)

15,867. "Improvements in and relating to the manufacture of filaments for electric lamps." A. BOURDOS. July 7th.

15,880. "Improvements in or relating to electric arc lamps." H. J. J. JANDUS, JUN. (Date applied for under Sec. 91 of the Act, May 26th, 1908, being date of application in Germany. An invention comprised in Application No. 7,471, dated March 29th, 1909.) July 7th. (Complete.)

15,881. "Improvements in or relating to electric arc lamps." H. J. J. JANDUS, JUN. (Date applied for under Sec. 91 of the Act, July 1st, 1908, being date of application in Germany. An invention comprised in Application No. 7,471, dated March 29th, 1909.) July 7th. (Complete.)

15,889. "Improvements in automatic electric regulators, output adjusters and the like." H. LEITNER. July 7th.

15,891. "Improvements in generators for wireless telegraphy and telephony with continuous oscillations." E. HUTH. July 7th. (Complete.)

15 918. "Improvements in or relating to what is known as photo-telegraphy." T. T. BAKER and PICTORIAL NEWSPAPER Co., LTD. July 7th.

15,929. "Improvements relating to electrical testing apparatus." T. E. GAMBRELL and C. T. GAMBRELL. July 8th.

15,960. "Improved electrolytic cell." J. F. FLOOD. July 8th.

15,978. "Improvements in or relating to electric signalling systems for railways and the like." J. D. TAYLOR. (Date applied for under Sec. 91 of the Act, January 30th, 1908, being date of application in United States.) (An invention comprised in application No. 1,788, dated January 25th, 1909.) July 8th. (Complete.)

15,980. "Improvements relating to telegraphy." B. DAVIES and A. R. HARDIE. July 8th.

15,981. "Improved method and means of producing synchronism between the rotation of a controlling machine and the rotation of one or more electrically-driven machines." E. L. A. LERTOURNE. July 8th. (Complete.)

15,985. "Improvements in sparking plugs for internal combustion engines." R. BOSCH. (Date applied for under Sec. 91 of the Act, March 1st, 1909, being date of application in Germany.) July 8th. (Complete.)

15,991. "Improved electric locking and unlocking device for locks." G. SAHMER. July 8th. (Complete.)

16,004. "Improvements relating to electrically-controlled pneumatic dispatch tubes, cash railways, and the like." C. W. BLUEMEL, E. A. BLUEMEL, F. H. BLUEMEL (trading as Bluemel & Bros., C. W. and P. R. Shill.) (Application for Patent of Addition to No. 3,770, 1908.) July 8th.

16,029. "Improved unidirection current dynamo-electric machine." R. WALLWORK, C. H. WALLWORK and B. J. SHILLITO. July 9th.

16,089. "Improved means for electrically igniting miners' safety lamps." J. PRESTWICK. July 9th. (Complete.)

16,095. "Improvements in electro-magnetic clutches." C. W. HILL. July 10th.

16,112. "Antiseptic telephone mouthpiece." B. ARCHER and J. DE COSTER. July 10th.

16,114. "Improvements in the controlling mechanism of automatic electric lifts." ELECTROMOTOR EQUIPMENT Co., LTD., and T. MEACOCK. July 10th.

16,146. "Preparation of material for the construction of fold up boxes for holding incandescent electric lamps." M. I. COOPER. July 10th.

16,155. "Improved device for automatically stopping electrically driven rotary printing presses when the folding cylinder is choked." F. N. PICKETT and ADAMS MANUFACTURING Co. July 10th.

16,167. "Improvements in or relating to the control of induction motors." M. MILCH. (Application for Patent of Addition to No. 1,467, 1907.) July 10th.

16,170. "Improvements in alternating current dynamo-electric machines." L. J. HUNT and SANDYCROFT FOUNDRY Co., LTD. July 10th.

16,174. "Improvements relating to enclosed electrical machines." H. A. MAVOR and MAVOR & COULSON, LTD. July 10th.

16,175. "Improvements in or relating to what is known as photo-telegraphy." PICTORIAL NEWSPAPER Co., LTD., and T. T. BAKER. July 10th.

16,177. "Improvements in and connected with telegraphic recorders and relays." A. ORLING. July 10th.

## PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. THOMPSON & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

### 1908.

ELECTRIC METERS. J. P. Winn. 4,666. March 2nd.

ALTERNATE CURRENT MOTORS. V. A. Fynn. 10,611. May 15th.

SAFETY DEVICES FOR ELECTRIC HEATING APPARATUS FOR LIQUIDS. British Prometheus Co., G. Cooper and F. C. Sharp. 10,680. May 16th.

METHOD OF AND MEANS FOR ADJUSTABLY SUSPENDING ELECTRIC INCANDESCENT LAMPS. C. E. Heldbek. 12,736. June 13th.

ELECTRO-MAGNETIC POWER VELOCITY RATIO DEVICES PARTICULARLY APPLICABLE FOR DRIVING AUTOMOBILES AND THE LIKE. A. H. Midgley and C. A. Vandervell. 12,788. June 18th.

AUTOMATIC CUT-OUT DEVICE FOR ELECTRICAL CONDUCTORS IN TRAMWAY SYSTEMS. M. G. Newbould. 13,048. June 18th.

ELECTRIC TRANSFORMERS. Akt.-Ges. Brown, Boveri & Cie. 13,092. June 19th. (Date applied for under International Convention, June 28th, 1907.)

PARTY LINE TELEPHONE SELECTORS AND CUT-OUTS. H. D. Williams. 12,101. June 19th.

ELECTRIC INSULATOR. C. M. Graham. 15,341. July 20th.

AUTOMATIC ELECTRIC SWITCHES. W. J. Davy. 15,936. July 27th.

STARTING SWITCHES FOR ELECTRIC MOTORS. E. Garside. 16,126. July 29th.

ELECTRIC VOLTAGE REGULATORS. British Thomson-Houston Co. (General Electric Co.) 16,299. July 31st.

ELECTRICALLY-OPERATED APPARATUS FOR CONTROLLING THE MOVEMENTS OF POINTS OR SWITCHES ON TRAMWAYS OR RAILWAYS. E. M. Munro and H. I. Rogers. 17,112. August 14th.

ELECTRIC IGNITION APPLIANCES. A. M. Low. 18,628. September 5th.

METHOD AND APPARATUS FOR ADJUSTING ELECTRICAL RESISTANCES. O. Cox. 18,925. September 9th.

ELECTRICAL RECORDING INSTRUMENTS. H. Bevis and J. W. Penicud. 20,638. October 1st. (Post-dated February 12th, 1909.)

ELECTRIC SWITCHES. B. R. Koe. 20,708. October 1st.

ELECTRICAL ALARM CLOCKS. D. H. Smith and L. A. Hearin. 22,263. October 20th.

ELECTRIC CANDLE FITTINGS. H. Hirst and J. H. Collings. 23,116. October 30th.

ELECTRICAL INSTRUMENT FOR PYROGRAVURE AND SURGICAL PURPOSES. P. Berville. 24,815. November 18th.